Energy, Mines and
Resources Canada

Énergie, Mines et
Ressources Canada

CANMET

Canada Centre for
Mineral and Energy
Technology

Centre canadien de la
technologie des
minéraux et de l'énergie

**Coal
Research
Laboratories**

**Laboratoires de
recherche sur
le charbon**

Canada

91-06128/

SUPPORTEK
INTERNATIONAL INC.

REPORT ON AN INSTRUMENTATION PROGRAM ON SPLIT SET CABLE SLINGS USED AS REMEDIAL SUPPORT IN LONGWALL GATEROADS AT PHALEN MINE 2 WEST PANEL

FINAL REPORT
BY
SUPPORTEK INTERNATIONAL INC.
QUEBEC, QUE.

Work on this project was conducted under the auspices of the Department of Energy, Mines and Resources

DSS FILE NUMBER :	038SQ.23440-9-9017
DSS CONTRACT NUMBER :	23440-9-9017/01-SQ
EMR SCIENTIFIC AUTHORITY :	W.D. Gallant Energy, Mines and Resources CANMET - Cape Breton Coal Research Laboratory
SUBMISSION DATE :	October 1990

172 pp

MICROMEDIA

"THIS WORK WAS SUPPORTED BY THE FEDERAL PANEL ON ENERGY R & D (PERD)"

SUMMARY

This report describes the implementation and the results of three different types of instrumentation that were used in two 60 m long test sites where Split Set cable slings were added to the existing steel set supports over a 20 m long section at the center of the test sites, in order to investigate the benefits of using cable slings as remedial supports in longwall gateroads.

The instrumentation used at each site was the following.

- 5 cable slings instrumented with one Tensmeg tension measuring gauge to monitor the load developing in the cable at the approach of the longwall face.
- 15 height and width convergence stations installed directly on steel sets, located from one end to another of the 60 m long test site.
- 15 strain measurement stations installed on each leg of the same steel sets already instrumented for the convergence measurements, using a mechanical strain gauge to read the change in distance between reference points and allowing to derive the axial load, bending moment and maximum stress acting in the leg of the steel set.

All of the three types of instrumentation worked properly during the whole duration of the approach of the longwall face to the instrumented sections, namely about five months at each test site, except for malfunctions which affected the mechanical strain gauge so that the first valid results for this instrument were only obtained shortly before the longwall face crossed the test sections.

The report provides a complete description of the instruments used and of their installation underground, together with details on the interpretation of their readings and finally a complete set of graphs of all the readings that were taken.

RÉSUMÉ

Ce rapport décrit la mise en place et les résultats de trois différents types d'instrumentation qui ont été utilisés dans deux zones d'essai de 60 m de longueur où des élingues Split Set ont été ajoutées aux cadres de soutènement en acier sur une section de 20 m de longueur localisée au centre des zones d'essai, de façon à documenter les avantages d'utiliser des élingues comme soutènement d'appoint dans les voies de taille.

L'instrumentation utilisée à chaque site était la suivante.

– 5 élingues instrumentées avec une jauge de mesure de tension Tensmeg pour faire le suivi de la force qui se développe dans le câble à l'approche de la longue taille.

– 15 stations de mesure de la convergence en hauteur et en largeur installées directement sur les cadres, répartis d'une extrémité à l'autre de la zone d'essai.

– 15 stations de mesure des déformations installées sur chaque piédroit des mêmes cadres déjà instrumentés pour la mesure des convergences, en utilisant un extensomètre mécanique pour lire les variations d'écartement entre des plots de référence ce qui permet d'établir la force normale, le moment fléchissant et la contrainte maximale s'exerçant dans le piédroit du cadre.

Les trois types d'instrumentation ont bien fonctionné pendant toute la durée de l'approche de la taille vers les sections instrumentées, soit environ cinq mois à chacun des sites d'essai, à l'exception d'écarts de fonctionnement qui ont affecté l'extensomètre mécanique de telle sorte que les premiers résultats valides à l'aide de cet instrument n'ont pu être obtenus que peu avant le passage de la taille à l'aplomb des section d'essai.

Le rapport contient une description complète de tous les instruments utilisés de même que de leur installation au fond. Il contient aussi des compléments détaillés sur l'interprétation des lectures de ces instruments de même que l'ensemble des graphiques établis à l'aide de toutes les lectures qui ont été prises.

REPORT ON AN INSTRUMENTATION PROGRAM ON SPLIT SET CABLE SLINGS USED AS REMEDIAL SUPPORT IN LONGWALL GATEROADS AT PHALEN MINE 2 WEST PANEL

TABLE OF CONTENTS

SUMMARY i

RÉSUMÉ iii

1. BACKGROUND AND SCOPE OF THE REPORT 1

2. DESCRIPTION OF THE INSTRUMENTATION PROGRAM 2
    - 2.1 Instrumented cable slings 2
    - 2.2 Convergence stations 5
    - 2.3 Strain measurements in steel sets 9

3. MEASUREMENT RESULTS 11
    - 3.1 Measurements on cable slings 12
    - 3.2 Convergence measurements 12
    - 3.3 Measurements on steel sets 13

4. SUCCESSES AND FAILURES OF THE VARIOUS INSTRUMENTATIONS AND OUTLINES OF INTERPRETATION 14
    - 4.1 Load in cable slings 14
    - 4.2 Convergence measurements 16
    - 4.3 Strain measurements in steel sets 16

5. CONCLUSION 18

6. RECOMMENDATIONS 19

ACKNOWLEDGEMENTS 20

BIBLIOGRAPHY 21

APPENDIX 1 : CERTIFICATE NO. 854 FOR INTRINSICALLY SAFE CABLE TENSION MEASURING SYSTEM MODEL TENSMEG-70

APPENDIX 2 : FORMULAE FOR INTERPRETATION OF STRAIN MEASUREMENTS IN STEEL SETS

APPENDIX 3 : DATA SHEETS, TEST SITE NO. 1 (BETWEEN STEEL SETS 631 AND 691), BOTTOM GATEROAD, 2 WEST PANEL, PHALEN MINE

APPENDIX 4 : DATA SHEETS, TEST SITE NO. 2 (BETWEEN STEEL SETS 781 AND 844), TOP GATEROAD, 2 WEST PANEL, PHALEN MINE

APPENDIX 5 : GRAPHS OF LOAD IN CABLE SLINGS, TEST SITES NO. 1 AND 2

APPENDIX 6 : GRAPHS OF CONVERGENCE MEASUREMENTS, TEST SITES NO. 1 AND 2

APPENDIX 7 : GRAPHS OF AXIAL LOAD, BENDING MOMENT AND MAXIMUM STRESS IN STEEL SETS, TEST SITES NO. 1 AND 2

1. BACKGROUND AND SCOPE OF THE REPORT

The Cape Breton Development Corporation (CBDC) operates three underground coal mines located on the eastern tip of Cape Breton in Nova Scotia. The coal is mined by the longwall method, using both the advancing and retreating systems with single roadways on each side of the longwall.

Considerable interest has been expressed in the recent years by CBDC regarding the use of rock bolting techniques as a potential primary/secondary gateroad support system. In October 1987, CBDC installed 3 Split Set cable slings as remedial support to improve bad ground conditions on the bottom gateroad of the 1 West panel at the Phalen Mine. The slings were installed on 1 m intervals midway between the existing trapezoïdal steel sets, which were also set on 1 m intervals.

Monitoring of the gateroad conditions by CBDC geologists suggested that as the longwall face approached the site, the conditions did not deteriorate as quickly as those in the areas normally supported by steel sets. However, although the results were inconclusive, they were sufficiently encouraging to recommend further investigations.

For this reason, a comprehensive research program was established by CANMET (Cape Breton Coal Research Laboratory, Department of Energy, Mines and Resources) in collaboration with CBDC in order to investigate more systematically the benefits of using Split Set cable slings in conjunction with trapezoïdal steel sets.

Two test sections were selected at the Phalen mine along the 2 West panel mined by a retreating longwall. These 60 m long test sections were selected in view of their potential for deformation associated with mining. Namely, the test site no. 1 located between steel sets 631 and 691 on the bottom gateroad exhibited potential for slight to moderate deformation and was supported by in seam rectangular supports, whereas the test site no. 2 located between steel sets 781 and 844 on the top gateroad was exhibiting potential for moderate to severe deformation and was supported by trapezoïdal supports.

As part of the research program, 20 cable slings supplied by Ingersoll Rand Co. were installed by CBDC with assistance from Ingersoll Rand and CANMET at 1 m intervals at each test site between the existing steel set supports. The cable slings were located in the central 20 m section of the 60 m long test sites. A comprehensive instrumentation program was implemented in order to monitor closely various parameters related to the behavior of the steel sets and the cable slings, both in the central 20 m section supported by cable slings in addition to the regular support and in the two 20 m long sections located before and after.

The services of Supportek International Inc. were requested in order to provide assistance in the definition of the instrumentation program and also to supply Tensmeg tension measuring gauges specially modified for the 1/2 inch cables of the Split Set slings. The mandate of Supportek International Inc. was also to assist CANMET and CBDC for a proper installation and use of the instruments at the test sites, to document the failures and successes associated with the readings taken on the instruments throughout the project and finally to submit a report detailing the above and containing also graphs of all readings of the various instruments.

2. DESCRIPTION OF THE INSTRUMENTATION PROGRAM

The instrumentation used at each site was the following.

- 5 cable slings instrumented with one Tensmeg tension measuring gauge.
- 15 convergence stations
- 15 strain measurement stations on steel sets.

A more detailed description of each instrumentation is given in the following sections.

2.1 Instrumented cable slings

The Tensmeg tension measuring gauge used on each sling is a device patented by Supportek International Inc. to measure the load in steel cables or steel rods used for ground reinforcement or similar purposes. A detailed description of the gauge is given in Choquet et al (1988).

The principle of the instrumentation is the same as for conventional strain gauges. It is based on the resistance variation of a thin 0.25 mm diameter nickel-chromium resistance wire which occurs during elongation of the cable on which it is attached. The wire is protected by a rubber tube and it is wound into the spiral grooves between the individual strands of the cable. The gauge is 70 cm long and has an electrical resistance of 70 Ohm. It is terminated at both ends by a moulded rubber anchor which is bonded to the cable by a quick-setting glue. The anchors are protected by a plastic tubing which allows for anchor movements during elongation of the cable. A photograph and a schematic of a gauge are shown in Figures 1 and 2.

Figure 1 : Photograph of a Tensmeg tension measuring gauge.

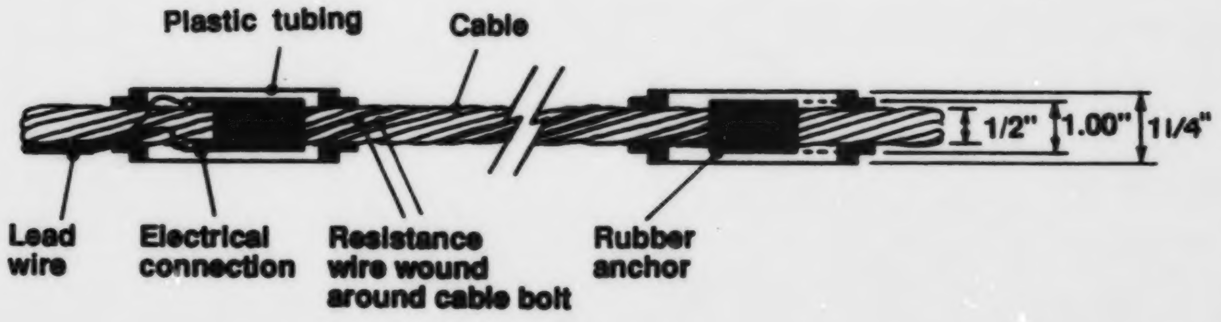

Plastic tubing
Cable
1/2"
1.00"
11/4"
Lead wire
Electrical connection
Resistance wire wound around cable bolt
Rubber anchor

Figure 2 : Schematic of a Tensmeg gauge installed on a steel cable.

Special gauges adapted to the size of 1/2 inch steel cables similar to the ones used for Split Set cable slings were manufactured by Supportek International. They were tested in a laboratory load frame in order to provide a calibration curve to convert the readings in micro-strains of the gauges to the actual tensile load acting in the 1/2 inch cable. The readings for the calibration tests were taken by the same strain indicator readout, namely a Vishay P-3500, that was to be used later at the mine, in conjunction with the 5 channel switching and connection unit supplied by Supportek International to connect the gauges to the strain indicator.

Four calibration tests were conducted and the results are shown in Figure 3. The four curves obtained are extremely similar to each other. It can also be observed on the graphs of the figure that the steel cable exceeds its yield limit at about 32 000 lb (142 kN) while the breaking strength is in the range of 37 500 lb (167 kN). The 1/2 inch steel cable are rated at a breaking strength of 41 600 lb (185 kN) by their manufacturer which is higher than the value reached in our calibration tests. The difference can probably be explained by the type of end attachments used to traction the cable which, in our tests, were cable grips supplied by the manufacturer. These cable grips can indent individual strands of the cable and cause a premature failure of one of the strands, therefore limiting the capacity of the cable.

Figure 4 shows the calibration curve to be used to convert the readings in micro-strains on the Tensmeg gauges to an axial load in 1/2 inch cables. This curve represents the average of the four curves of Figure 3 and it is extrapolated to 185 kN which corresponds to the rated breaking strength of the cable.

Ten 1/2 inch cables to be used in the Split Set slings of the trial were shipped by Ingersoll Rand to Supportek International's premises to be instrumented with the specially developed Tensmeg gauges. The gauges were mounted in the middle of the 12 m long cables and one of the gauge anchors was waterproofed leaving the other anchor, namely the one on which the lead wire would later be connected, to be waterproofed at the time of installation of the cable sling. The cables were then coiled in 1.5 m diameter coils and shipped to Phalen mine at the end of December 1989. The installation of the instrumented cable slings by CANMET and CBDC personnel took place in January 1990 for the five slings at test site 1 and in February 1990 for the five other slings at test site 2.

During the installation, the sling was positioned at the roof of the roadway, then the lead wire, also supplied by Supportek International, was connected to the gauge, allowing to close the plastic tubing on the gauge anchor and to waterproof it completely. An initial reading was then taken on the gauge still untensioned, then the cable sling was tensioned by inserting the two Split Sets in the roof of the roadway (Figure 5). Another reading was then taken in order to measure the amount of tension that had developed in the cable sling.

The length of lead wire used with the gauges was rather short, namely ranging between 15 m and 39 m at each test site for the closest and furthest gauge to the readout location. Desensitization of the gauges due to lead wire length is rather minimal in this range of length (between 1 and 2.7% desensitization), therefore it was decided not to take it into account in the conversion of the readings in micro-strains to the tension load in the cable.

In a similar fashion, the change in temperature in the roadways during the course of the trial was judged to be of very little influence on the value of the gauge readings. Indeed, the drift of readings of Tensmeg gauges due to a change of temperature of a few degrees Celsius is very small (Choquet et al, 1988) and it was then judged unnecessary to account for it in the reading conversions.

Finally, it should be mentioned that all the instruments related to cable sling monitoring were certified by CANMET (Ottawa) as intrinsically safe before use and were approved for use by Labour Canada. The certificate no. 854 issued (see Appendix 1) covers all components, namely the Tensmeg gauges, the lead wires, the Vishay P-3500 strain indicator and the five channel switching and connection unit.

2.2 Convergence stations

Convergence stations were established by CANMET directly on fifteen steel sets belonging to each of the two test sites.

There were two types of convergence stations. Height convergence stations consisted in one notch on the roof beam of the steel set and one 50 cm long rebar pin grouted in the floor, allowing to measure the distance between the two reference locations with a measuring tape graduated in millimeters. Width convergence stations consisted in two notches on the legs of the steel set between which the distance could also be measured.

The distance measurements are then easily converted to changes in height and changes in width by subtracting readings taken during the course of the test to the initial reading taken on the first day of the test. The accuracy of the measurement is obviously in terms of millimeters. However, due to the amount of movement which was expected, this accuracy was deemed largely sufficient.

Height and width convergence stations were installed on steel sets of site 1, while only height convergence stations were installed on site 2.

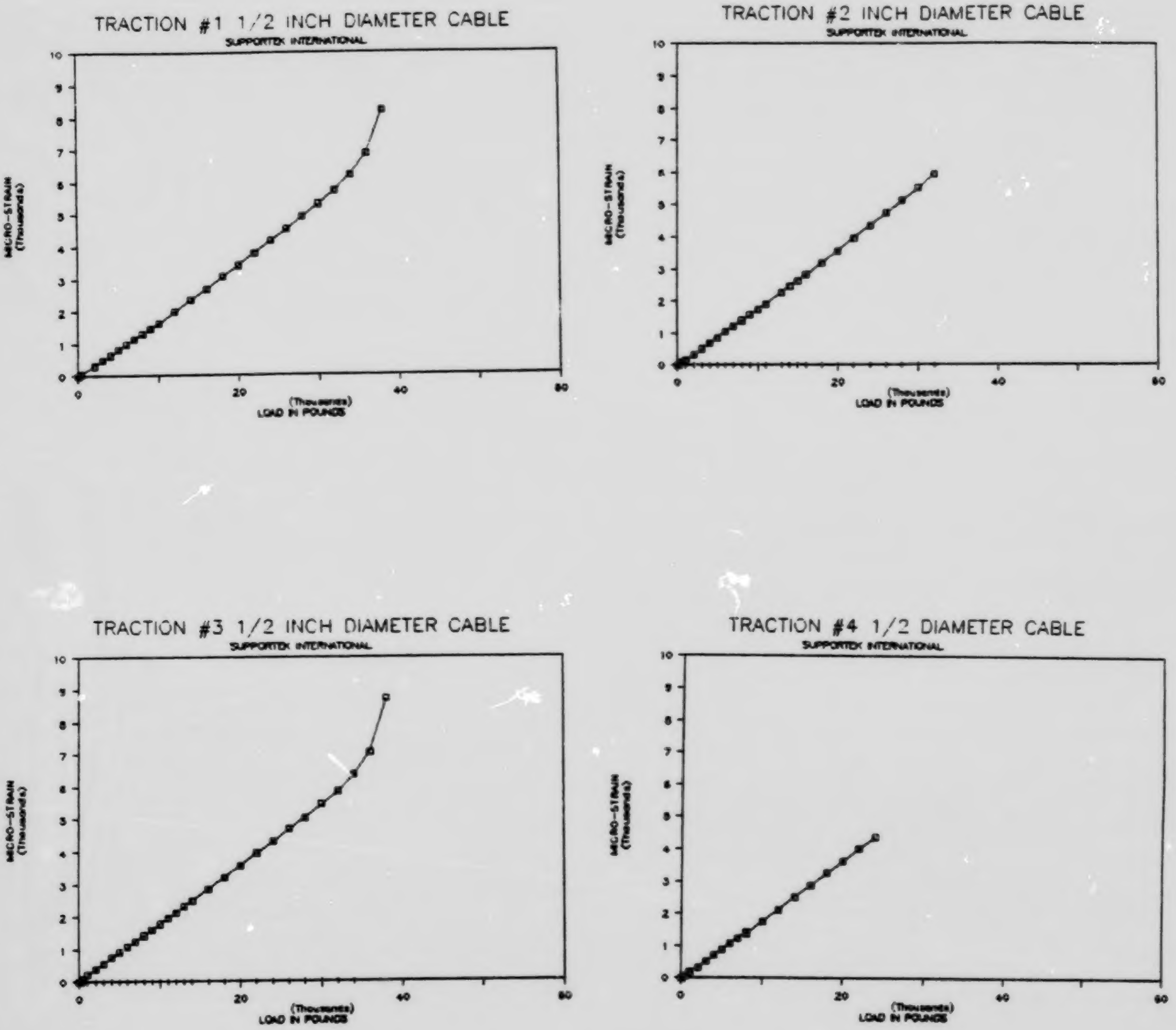


Figure 3 : Calibration tests for Tensmeg gauges in a laboratory load frame.

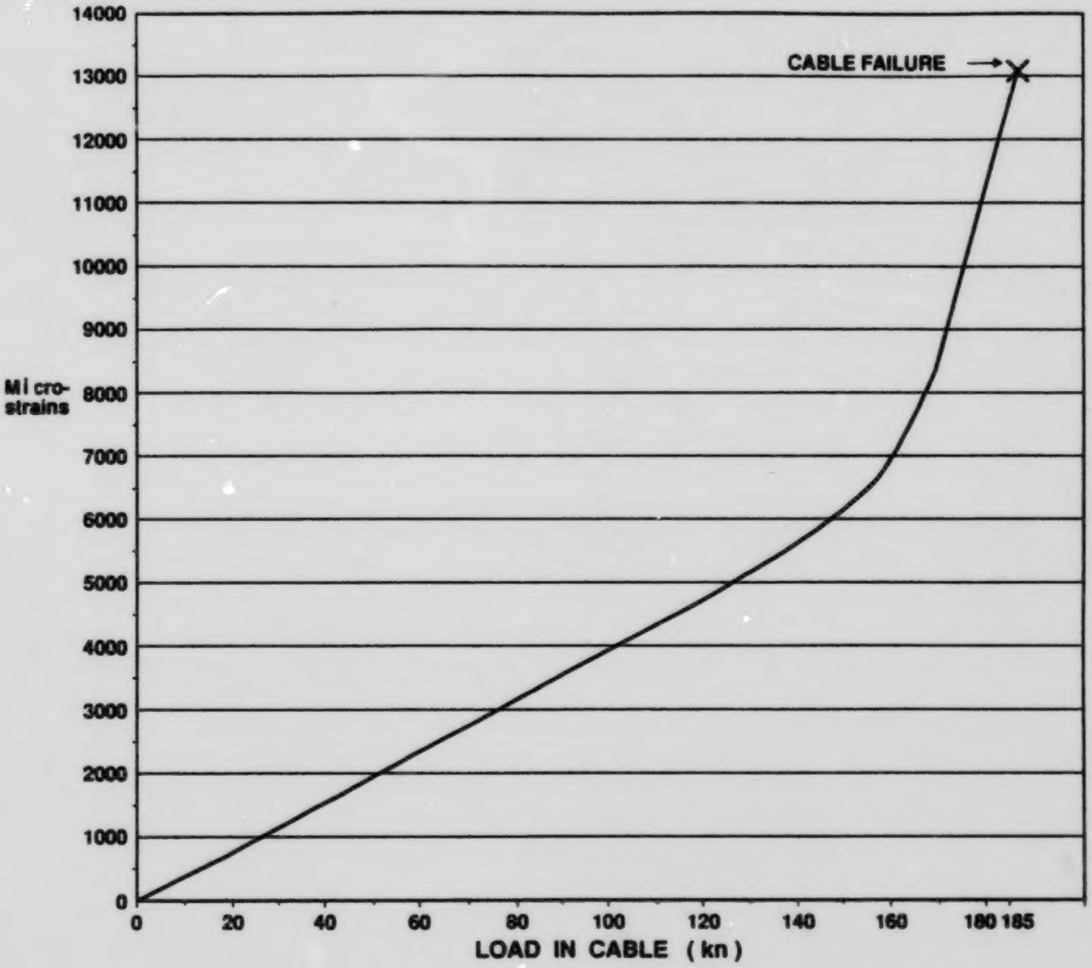


Figure 4 : Calibration curve for the readings of the Tensmeg gauge mounted on a 1/2 inch steel cable.

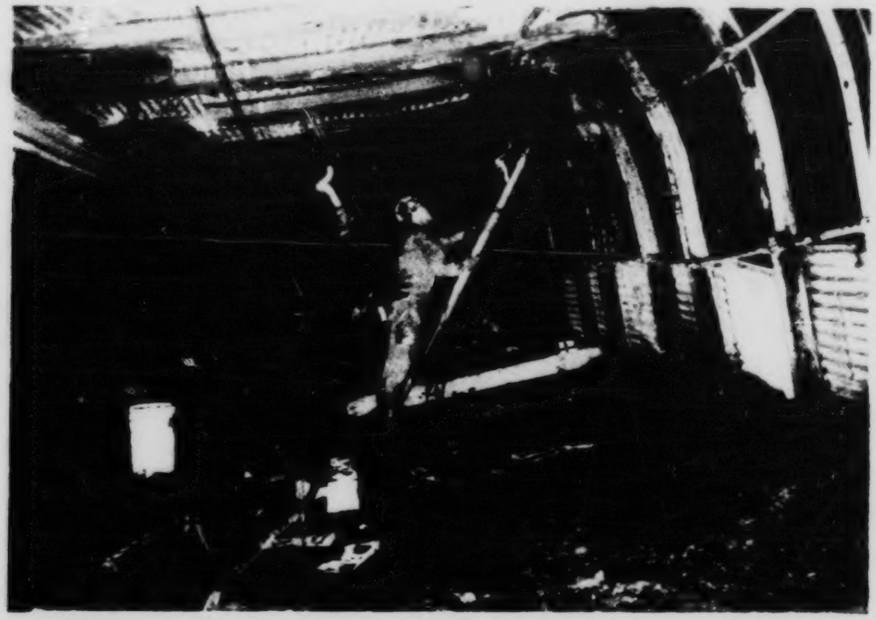


Figure 5 a) : Tensioning of an instrumented cable sling at test site 1.

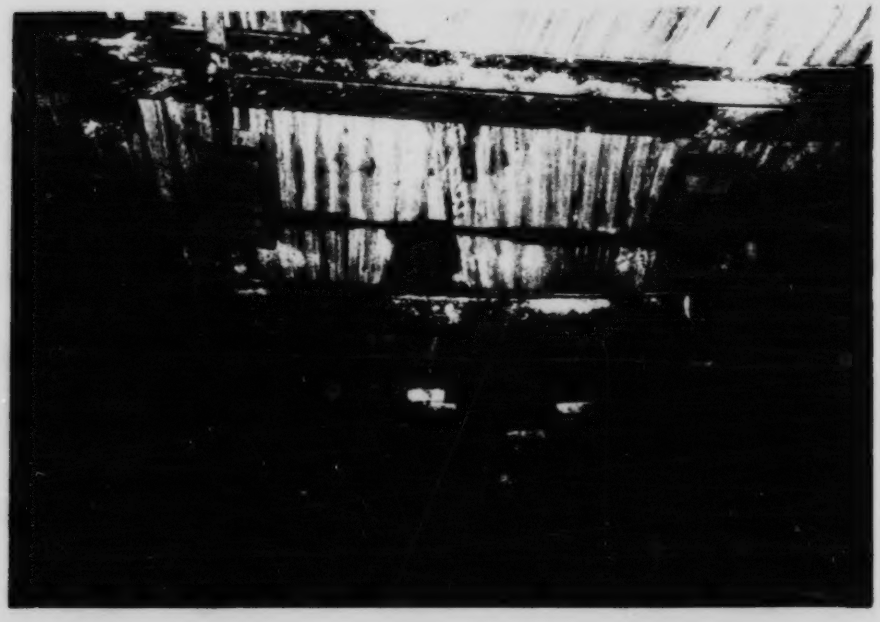


Figure 5 b) : View of a Tensmeg gauge on a tensioned cable sling.

2.3 Strain measurements in steel sets

A mechanical strain gauge model CT-171 manufactured by Soiltest was used to conduct the strain measurements in the steel sets. This instrument is similar to a Whittemore strain gauge and comprises a dial indicator (Figure 6) graduated in 0.0001 inch (one ten thousands of an inch). The length of the measuring base can be varied between 2 and 10 inches.

Using these values in the well-known Hooke's formula, the magnitude of the smallest change of stress that can be detected in the steel sets is the following (σ : stress; E : Young's modulus of steel; ε : strain) :

$$\sigma = E \cdot \varepsilon$$

$$= 30.10^6 \times . \frac{0.0001}{10}$$

$$\sigma = 300 \text{ psi } (2.0 \text{ MPa})$$

Since the yield limit of the steel of the steel sets is 350 MPa, the readings are in an acceptable range of sensitivity, although this sensitivity may not be high enough if the magnitude of change in stress to be monitored is significantly smaller than the value of 350 MPa. Also, the readings are highly sensitive to a change of temperature which affects both the steel on which measurements are made and the instrument in itself. Therefore, reference measurements on an invar bar supplied by the manufacturer need to be taken prior to each set of measurements on different days, and at each sites 1 and 2 to apply a correction to the readings of the instrument. A second correction for dilation of the steel of the steel set due to temperature change need also to be applied.

CANMET and Supportek International were aware of the limitations of the mechanical strain gauge due to its relatively low sensitivity and to the correction to be applied for changes in temperature in the roadways. It was nevertheless decided to use the instrument because it presented the opportunity of conducting at low cost a great number of strain measurements in many steel sets. These strain measurements could then be interpreted in terms of the amount of load applied to the steel sets at the approach of the longwall face.

The steel set instrumentation was conducted in accordance with a procedure initially proposed by Kovari et al (1977) for use on tunnel concrete linings and later adapted by Choquet (1982) for use on steel sets. A somehow similar method of instrumentation of steel sets had also been used in 1965 by the National Coal Board in the United Kingdom (N.C.B., 1965).

The principle of the method consists in setting reference points in the steel sets that act as contact seats on which the reference contacts of the mechanical strain gauge can be positioned to conduct the strain measurement.

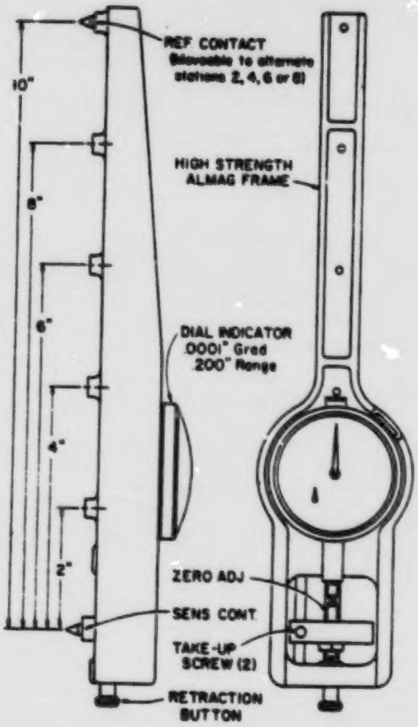

REF CONTACT (Moveable to alternate stations 2, 4, 6 or 8)
10"
HIGH STRENGTH ALMAG FRAME
8"
6"
DIAL INDICATOR .0001" Grad .200" Range
4"
2"
ZERO ADJ
SENS CONT
TAKE-UP SCREW (2)
RETRACTION BUTTON

Figure 6 : Schematic of mechanical strain gauge model CT-171.

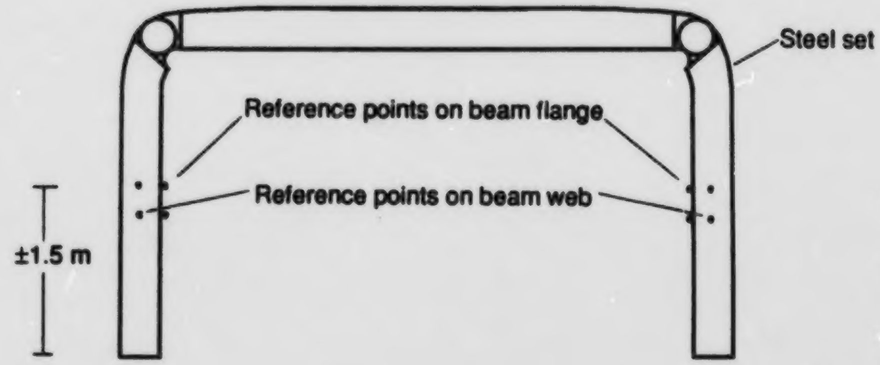

Steel set
Reference points on beam flange
Reference points on beam web
±1.5 m

Figure 7 : Location of strain measurements on steel sets.

Various trials were made by CANMET in order to glue the reference points to the steel sets but the attempts did not prove successful. For this reason, CANMET decided to drill holes in the steel of the steel sets in order to epoxy in the reference points and ensure thereby that they were properly set. A total of 15 steel sets were instrumented at each sites 1 and 2, which were namely the same steel sets on which convergence measurements described in section 2.2 were also conducted.

On each instrumented steel set, 4 pairs of reference points with a spacing of 10 inch between reference points of the same pair, were installed (Figure 7). Two pairs were installed on each leg of the steel set at about 1.5 m from the floor. One pair was located in the middle of the flange of the steel beam and the other pair in the middle of the web.

As discussed in Choquet (1982), two strain measurements at the same location in the steel beam allow to compute the axial load and the bending moment acting in the beam, and also the maximum stress in the steel which is a function of the two first values. The formulae to derive these parameters are given in Appendix 2, together with the correction for the change in temperature that causes dilation or contraction in the steel of the steel set.

3. MEASUREMENT RESULTS

As mentioned earlier, the instrumented cable slings were installed in January 1990 at site 1 and in February 1990 at site 2. The convergence stations were installed approximately at the same time, while the mechanical strain gauge reference points were installed somehow later, namely in April 1990.

The various instruments were read at regular intervals after their installation up to the moment where the longwall face had passed across the location of the instrumented section in the roadway. At this time, it became impossible to read the convergence stations and also to use the mechanical strain gauge on the instrumented steel sets. However, it was still possible to read the instrumented cable slings for as much as 30 m after passage of the longwall face, because of the longer lead wires which were used.

The longwall face crossed test site 1 in May 1990 and test site 2 in July 1990.

The results of all measurements are presented in Appendices 3 to 7. Appendices 3 and 4 contain the data sheets respectively for test sites no. 1 and 2 and Appendices 5, 6 and 7 contain the graphs derived from the data sheets for the cable slings, the steel sets and the convergence measurements. It should be noted that the data sheets presented are of two types. There are the raw data sheets which correspond exactly to the field data sheets which are not included in the report because of their too large number. The raw data sheets present the advantage of being tabulated in the same way as the sheets of converted datas which are the actual values plotted on the graphs.

A standard presentation was adopted for the x-axis of all the graphs presented in the appendices 5 to 7, namely by plotting the distance of the measurement station from the longwall face which was approaching. For instance, a negative value of -100 m means that the longwall face was 100 m before the measurement station. A positive value means that the longwall face has passed the measurement station, which applies only for the measurements on cable slings as mentioned before. The distance from the longwall face was calculated for every graph by subtracting the number of the steel set on which the instrumentation is installed from the number of the steel set at which the longwall face was standing on the day the measurement was made, this information being provided on the field data sheets. The value was then converted to the distance from the longwall face, assuming that all steel sets were spaced at 1 m intervals.

Also for the y-axis, the extreme values chosen correspond to the limiting values which could eventually have been reached if the instrumented steel set or cable sling had been solicited to the highest level.

These limiting values together with a few details on the procedure used to establish the graphs are described briefly in the following sections.

3.1 Measurements on cable slings

The 5 graphs for each of sites 1 and 2 are presented in Appendix 5. The limiting value chosen for the y-axis is 180 kN which corresponds to the breaking strength of 185 kN rated by the manufacturer for the 1/2 inch cable as mentioned earlier in section 2.1. Actually, it can be observed on the graph for cable sling 818.5 on site 2 that a limiting value of 178 kN was reached after passage of the longwall face and that the capacity of the sling subsequently fell to a lower value of about 165 kN.

3.2 Convergence measurements

The 30 graphs for site 1 (height and width convergence) and the 15 graphs for site 2 (height convergence) are presented in Appendix 6. The limiting values chosen for the y-axis extend between -500 mm and +200 mm. A negative value corresponds to a true convergence, that is a reduction in height or in width, whereas a positive value corresponds to an increase in height or width.

As expected, most of the readings were negative, the highest level of convergence monitored being in the range of -100 mm in site 1 and -150 to -200 mm in site 2.

3.3 Measurements on steel sets

A total of 51 graphs are presented in Appendix 7 for site 1 and 67 graphs for site 2. They are the following.

Site 1 : 8 graphs of axial load (leg on low side)
9 graphs of axial load (leg on high side)
8 graphs of bending moment (leg on low side)
9 graphs of bending moment (leg on high side)
8 graphs of maximum stress (leg on low side)
9 graphs of maximum stress (leg on high side)

Side 2 : 10 graphs of axial load (leg on low side)
13 graphs of axial load (leg on high side)
10 graphs of bending moment (leg on low side)
12 graphs of bending moment (leg on high side)
10 graphs of maximum stress (leg on low side)
12 graphs of maximum stress (leg on high side)

Actually, the number of graphs should have been greater, namely 15 for each category since there were instrumented steel sets at each site. However, the number of valid readings was significantly reduced because of malfunctions of the mechanical strain gauge explained in a following section.

The following limiting values were chosen for the y-axis of each type of graph.

For the axial load, the limiting values extend between -1 300 kN and +500 kN. A negative value corresponds to a compressive axial load. The value of -1 300 kN was chosen because it corresponds to the load at which the yield limit of the steel of the steel sets is exceeded in pure axial loading (no bending moment), as obtained in the following formula (see Appendix 2 for value of area of beam cross section).

$$\begin{aligned}\text{Load at yield limit} &= \text{yield limit x area of beam cross section}\\ &= 350\ \text{MPa} \times 3.79 \cdot 10^{-3}\ \text{m}^2\\ &= 1.32\ \text{MN}\end{aligned}$$

$$\text{Load at yield limit} = 1\ 320\ \text{kN}$$

For the bending moment, the limiting values extend between -50 kN.m and +50 kN.m. A negative value corresponds to a bending moment which induces a compressive stress at the interior flange of the steel set. The interior flange is the one on which the pair of reference points were installed (see Figure 7). The value of -50 kN.m was chosen because it corresponds to the bending moment at which the yield limit of the steel of the steel sets is exceeded in pure bending (no axial load), as obtained in the following well-known formula for the stress due to a bending moment (see appendix 2 for value of moment of inertia and distance from median fiber to flange).

$$\text{Bending moment at yield limit} = \frac{\text{yield limit x moment of inertia}}{\text{distance from median fiber to flange}}$$

$$= \frac{-350 \text{ MPa x } 1001 \cdot 10^{-8} \text{m}^4}{6.35 \text{ x } 10^{-2} \text{m}}$$

$$= -0.0552 \text{ MN} \cdot \text{m}$$

$$= -55.2 \text{ kN} \cdot \text{m}$$

For the maximum stress, the limiting values are -400 MPa and +400 MPa. A negative value corresponds to a compressive stress in the steel of the steel set. The value of -400 MPa was chosen because the yield limit of the steel is -350 MPa as mentioned earlier and the ultimate strength is 500 MPa for the 50 B grade of steel used in the steel sets.

Also, it should be mentioned that temperature corrections for both the reference measurement on an invar bar in order to correct the readings of the mechanical strain gauge and to account for the dilation and contraction of the steel of the steel sets were applied. The corrected values of the readings of the mechanical strain gauge are shown in Appendices 3 and 4. As can be seen by looking at the corrected values, the corrections applied were very often important relative to the magnitude of the measured strain, which has almost certainly affected the accuracy of the total instrumentation as discussed in a further section.

4. SUCCESSES AND FAILURES OF THE VARIOUS INSTRUMENTATIONS AND OUTLINES OF INTERPRETATION

4.1 Load in cable slings

All of the 10 instrumented cables slings responded very successfully during the whole duration of the instrumentation program, that is about five months at each test site.

No incident was noticed on the field data sheets, except that the lead wires conducting to cable slings 814.5, 818.5 and 822.5 at test site 2 were severed inadvertantly by an electrician on or prior to May 30, 1990. The previous set of readings had been taken on May 1 which means that the situation had stayed unnoticed during one month. After repairing the connections, a new set of readings was taken on May 30, when the distances from the longwall face were respectively -126.5 m, -130.5 m and -134.5 m for the three cable slings. When looking at the graphs, it is interesting to note that the readings taken on this day show the same amount of load as the previous and next readings, therefore the repair of the severed lead wire does not seem to have affected the validity of the instrumentation. However it can be noticed that cable sling 810.5 shows a very significant drop of reading on the same day to a negative value of about -5 kN which does not make sense since the lowest value to be expected should be 0 kN, meaning that the cable sling is completely unloaded. There may be various explanations to this negative reading, which in any circumstance, confirms that the cable sling has very probably lost all of its tension load between May 1 where the previous set of readings was taken and May 30. One of these explanations is that the lead wire of cable sling 810.5 has also been affected at the same time as the lead wires of cable slings 814.5, 818.5 and 822.5 so that the reading of cable sling 810.5 was slightly altered to read a negative value, instead of zero. Another explanation is that a negative drift of reading of the Tensmeg gauges equivalent to -5 kN has taken place during the course of the instrumentation and that the accurate value that should have been read is 0 kN. In that case, the drift would be equivalent to 200 micro-strains as can be seen on the calibration curve in Figure 4. Actually, there is a possibility that a drift of 200 micro-strains or somehow smaller has taken place in the Tensmeg gauges since drifts of similar magnitude have already been observed by Supportek International in other instrumentations. (The drift problem in Tensmeg gauges has since then been corrected by changing some details in the maufacturing process). Generally, this drift occurs immediately after mounting the gauge on the cable and lasts for one month, although most of the drift takes place in the first few days. In the case of the instrumentation at Phalen mine, the gauges were already mounted on the cables since December 1989 so the drift should already have taken place at the time of taking the first readings of cable sling 810.5 in February 1990. A possible explanation is that the cables were kept coiled until a few minutes prior to their installation and tensioning and that the uncoiling of the cable initiated some drift in the gauge.

Looking at the general pattern of all the graphs in Appendix 5, it can be noted that the same trend is always observed, namely that the pre-tension in the cables at the installation of the cable slings is in a range between 23 and 38 kN, then there is a certain reduction of tension load in the following days that can reach 5 to 10 kN. Afterwards the tension remains relatively stable until the longwall face approaches to about 20 to 50 m from the cable sling. The load starts then to increase to about 40 kN at site 1 and to about 80 to 140 kN at site 2 when the face is exactly crossing the location of the cable sling. Afterwards the load increases even more to reach a maximum before it drops, probably because of the complete collapse of the gateroad.

The Tensmeg gauges were able to monitor the same behavior for all of the instrumented cable slings which tend to confirm the shape of the loading pattern of the cable slings in the type of situation in which they were used.

4.2 Convergence measurements

The convergence measurements were not presenting any technological specificity, therefore their interpretation is very straightforward.

Actually the height convergence curves of site 1 are extremely consistent and show that there is no significant convergence until the longwall face has approached to about 50 m from the steel set on which convergence is measured. Then, the convergence increases rapidly to reach about -100 mm at the time where the face crosses the steel set. Unfortunately, most of the height convergence curves of site 2 are not complete since the measurements were interrupted, due to operational requirements, when the longwall face was about 20 to 40 m before the steel set. However, a few curves are almost complete and they show a convergence in excess of -150 mm.

In an opposite manner, the width convergence curves of site 1 show very little convergence, since it does not exceed a few millimeters, even at the passage of the longwall face.

4.3 Strain measurements in steel sets

Strain measurements in steel sets were intended to determine loading on the steel sets occuring during the approach of the longwall face. As explained in section 2.3, the strain measurements were performed by using a mechanical strain gauge. The readings are then converted in an axial load, a bending moment and a maximum stress acting in the leg of the steel set. The axial load is probably the most representative illustration of the loading acting on the steel set since it corresponds directly to the amount of load applied by the ground convergence.

On the other hand, the bending moment is also a measure of the load applied to the steel set but its magnitude originates more from the eccentricity of the applied load than from the magnitude of the load itself. However this bending moment results in a stress acting in the steel set legs which is added to the stress resulting from the axial load. Therefore, the maximum stress acting in the legs is also a representative illustration of the loading acting on the steel set. It is also well known that if this maximum stress was exceeding the yield limit of the steel, plastic deformations of the steel would then occur.

At the time when the mechanical strain gauge readings were initiated at each of the two test sites, the steel sets were already in place for a certain time. Therefore it is probable that they were already carrying a certain amount of load, but this value was not known. The instrumentation was then intended only to monitor the load resulting from the approach of the longwall face as stated above.

Unfortunately, various difficulties were encountered during the use of the mechanical strain gauge. The principal one was that it was discovered on May 1 that an adjustment screw for the zero adjustment of the gauge (see Figure 6) was somehow loose. Consequently, all readings taken prior to this date were not valid. Another incident occurred on May 14 when the dial indicator showed malfunctions and had to be returned to the supplier for replacement. The new dial indicator was received on May 18 and although the readings from May 1 to May 14 could theoretically have been used with the help of the reference measurements on the invar bar with the old and the new dial indicator, it appeared that the corrected values were too different and consequently the readings from May 1 to May 14 had also to be dropped.

With this situation having risen, it was only possible to plot values for 8 to 9 steel sets from 657 to 691 at site 1 and for 10 to 13 steel sets from 791 to 844 at site 2. Indeed, the longwall face was at the steel set 652 on the day where the readings start to become valid at site 1 and was at the steel set 784 at site 2 because no reading except one at steel set 688 was taken at site 2 until steel set 784. Therefore, the graphs presented in Appendices 3 and 4 are only showing changes in axial load, bending moment and maximum stress, starting from the time when the longwall face is at 5 to 39 m from the instrumented steel set at site 1 and at 7 to 60 m at site 2.

Looking at graphs of Appendix 7, the following observations can be made.

For the graphs of the axial load, there is a rather strong scattering of values between -20 to -30 kN to +20 to +30 kN at site 1 and between -100 kN to +100 kN at site 2. Some steel sets show however a definite tendency to an increased axial load, reaching -120 kN (compressive) at sites 1 and 2.

For the graphs of the bending moment, the scattering is as pronounced as for the axial load. The values are in a range of -2 to -5 kN•m to +2 to +5 kN•m at the two sites but with a visible tendency to -8 to -16 kN•m for some steel sets.

The graphs of the maximum stress are the ones which are the most conclusive in that most of them show a similar tendency, namely that the change of stress is rather limited, between -30 to -100 MPa (compressive) at site 1 and between -50 to -100 MPa at site 2, except for one steel set which reached -250 MPa.

The scattering of the points on the graphs of the maximum stress appears smaller than on the graphs for the axial load and the bending moment, which might confirm that there are two different causes to this scattering. The first cause is certainly related to the low sensitivity of the mechanical strain gauge as discussed in section 2.3, whereas the second cause might be that the approach of the longwall face is indeed causing rapid changes in the loading of the steel sets, with great variations in the axial load and bending moments in the legs, and also with significant differences between the high side legs and the low side legs. This second cause could explain the greater fluctuations on the graphs of axial load and bending moment and the more consistent readings on the graphs of maximum stress since the maximum stress is calculated by combining the values of the axial load and the bending moment, as can be seen in the formulae in Appendix 2.

In practical terms however, and keeping in mind that the strain measurements conducted are only indicative of load changes which have occurred when the longwall face was at a few meters from the instrumented steel sets, it appears that these load changes are not extremely important and that none of the steel sets has experienced a very high level of loading. Indeed, the highest readings reported above for the axial load, bending moment and maximum stress are only equivalent to a small fraction of the limiting values reported in section 3.3. A more detailed analysis of the results need however to be conducted in order to compare loading of the steel sets in the areas of the test sections where they were used alone with the areas where they were used in conjunction with the cable slings, taking also in account the potential for deformation of the gateroad which was identified either as slight, moderate or severe prior to the beginning of the trial, as reported in section 1.

5. CONCLUSION

The instrumentation program on Split Set cable slings used as remedial support between existing steel set supports in two trial sections at Phalen mine was monitoring three different parameters, namely the load in the cable slings, the height and width convergences of the steel sets and finally the strains also developed in the steel sets.

All of the three types of instrumentation worked properly and proved to be well adapted for use underground. They were able to give valuable readings during the whole period of approach of the longwall face to the test sections, up to the crossing of the test sections by the longwall face. The measurement of load in cable slings could even be conducted a few meters behind the longwall face.

The main malfunctions encountered during the instrumentation program were that of the mechanical strain gauge from which it was not possible to get valuable readings until the longwall face was at about 40 to 60 m before the test sections. Nevertheless, the instrument gave consistent readings, although they were affected by a rather strong scattering related to the relatively low sensitivity of the instrument in comparison with the magnitude of the strains that were measured.

On the other hand, the Tensmeg gauges used to monitor the load in cable slings worked very satisfactorily and did not show any sign of malfunction. They have provided a complete profile of the load in the ten instrumented slings during the whole course of the instrumentation program. The convergence measurements, although based on a very simple and straightforward principle, provided also very valuable information during the whole course of the instrumentation program.

6. RECOMMENDATIONS

The present report contains only outlines of interpretation of the numerous measurements which were recorded at the two test sites. A more detailed analysis of the results should be conducted, as mentioned in section 4.3, in order to compare the sections at each test site which were supplemented with cable slings as remedial support, with the section where the steel supports were used alone.

Also, if another instrumentation was conducted in a similar situation, it is felt that the same instruments could be used again to achieve the same level of success. Actually, it is felt that the strain measurements would give better results than in the present instrumentation since the same malfunctions related to the instrument itself would probably not be experienced again.

One of the advantages of the mechanical strain gauge was to allow to perform numerous measurements on many steel sets at low cost. However, if a method with a higher sensitivity of readings was to be selected, vibrating wire strain gauges or other similar instruments would probably be adequate. A further advantage of vibrating wire strain gauges is also that they would be compatible with data logging technology now commonly used in geotechnical monitoring applications.

ACKNOWLEDGEMENTS

Supportek International Inc. have enjoyed participating in the instrumentation program reported herein. Indeed the project has been a cooperative one in which many individuals have put a lot of efforts, at times in conditions which were not so easy, especially in the underground environment which does not facilitate the type of precision work required for a successful instrumentation.

Supportek International Inc. would like to thank the staff of Phalen mine and Cape Breton Development Corporation for their most valuable input and assistance throughout the project and also the staff of CANMET, namely Bill Gallant, Daniel Chipman and Shane O'Leary who among other things spent numerous hours installing the instruments and taking the readings, and also Dr. Timothy R. Aston from CANMET and Steve Forgeron from Cape Breton Development Corporation who participated in the definition of the project. The assistance of Cape Breton Development Corporation and CANMET in funding the project and of Ingersoll Rand Co. for various details and inputs related to the cable sling instrumentation and finally the support of Bill Gallant, Sr. Tech. are gratefully acknowledged.

Yours truly,

SUPPORTEK INTERNATIONAL INC.

P Choquet

Pierre Choquet, Ph.D., P.Eng.

BIBLIOGRAPHY

CHOQUET, P. A failure criterion of steel arch supports for the interpretation of in situ monitoring results, 14th Canadian Rock Mechanics Symposium, Vancouver, May 13-14, 1982, CIM Special Volume 30, Ed. Peter Baumgartner, 1982.

CHOQUET, P., MILLER, F. Development and field testing of a tension measuring gauge for cable bolts used as ground support. CIM Bulletin, vol. 81, no. 919, pp. 53-59, July 1988.

KOVARI, K., AMSTAD, CH., FRITZ, P. Integrated measuring technique for rock pressure determination, International Symposium on Field Measurements in Rock Mechanics, Zurich, pp. 289-316, April 4-6, 1977.

NATIONAL COAL BOARD, Central Engineering Establishment, Strain measurements on underground arches, Report no. LT 646, 28 pages, 1965.

APPENDIX 1

CERTIFICATE
NO. 854
FOR INTRINSICALLY SAFE CABLE TENSION MEASURING SYSTEM
MODEL TENSMEG-70

Energy, Mines and Resources Canada
Canada Centre for Mineral and Energy Technology

Énergie, Mines et Ressources Canada
Centre canadien de la technologie des minéraux et de l'énergie

CANMET

555 Booth Street
Ottawa, Canada
K1A 0G1

555 rue Booth
Ottawa, Canada
K1A 0G1

Your file

Our file
C015-S57-1

**THIS CERTIFIES THAT
INTRINSICALLY SAFE
CABLE TENSION MEASURING SYSTEM
MODEL TENSMEG-70
WITH SERIAL NUMBERS AS LISTED IN THE ASSOCIATED SCHEDULE
MANUFACTURED AND SUBMITTED BY
SUPPORTEK INTERNATIONAL INC.
SUITE 706
1130, CHEMIN SAINTE-FOY
QUÉBEC, QUÉBEC
G1S 4P7**

has been investigated by Energy, Mines and Resources, Canada, and when constructed and implemented in accordance with the provisions of the associated schedule is deemed to comply with the relevant provisions of Canadian Standards Association Standard C22.2 No. 157 - M1987 "Intrinsically Safe and Non-Incendive Equipment for use in Hazardous Locations", gaseous mines category.

Certificate No. 854
December 21, 1989

G. Lobay
Certification Officer

Canada

SCHEDULE

Associated with Energy, Mines and Resources, Canada, Certificate No. 854 dated December 21, 1989, and issued to Supportek International Inc., Québec, Québec.

Issue No. 1
December 21, 1989

Certified Apparatus

The apparatus certified herein consists of instrumentation intended to measure wire rope strain. The system consists of:

1) a strain gauge assembly consisting of two moulded units which are formed onto the wire rope whose tension is being monitored. The moulded units are connected together by tension wires, whose electrical resistance will vary according to the wire rope strain;

2) a five channel switching and connection unit;

3) cables, complete with Amphenol connectors, for connecting the strain sensors to the switching and connection unit, and to the Digital Strain Indicator;

4) a battery powered Digital Strain Indicator Model P-3500, manufactured by Measurements Group Inc.;

Items 1, 2, and 3 contain passive electrical devices and components only. Item 4 has been investigated and found to comply with the relevant requirements of CSA Standard C22.2 No. 157 - M1987, gaseous mines category.

Conditions of Certification

1. Scope

No inference is to be made as a result of the issuance of this certification that the certified product complies with any specification not specifically provided for herein. The certified product shall be constructed, implemented and formulated, as applicable, in accordance with all provisions

continued...

of this certification documentation, including drawings, specifications, and product descriptions. The product shall be marked in accordance with EMR's current published marking requirements.

2. Certification Labels

This EMR Certification applies only to apparatus as described herein and bearing the EMR certification plate identified as follows:

Certificate No.	Plate No.	Unit Serial No.
854	927	83108

3. Special Conditions of Use

3.1
Item 2 (the five channel switching and connection unit) mentioned under "Certified Apparatus" herein shall be installed in a non-aluminum enclosure.

3.2
The Amphenol connectors forming part of Item 3 (cables and connectors) mentioned under "Certified Apparatus" herein are aluminum, and shall be protected from impact by suitable nonmetallic sleeving.

3.3
Item 4 (Digital Strain Indicator) mentioned under "Certified Apparatus" shall be fitted with a non-aluminum protective case to protect the aluminum chassis from accidental impact.

3.4
Batteries for use with item 4 shall be either standard carbon-zinc or alakaline batteries (size NEDA13A - "D" cells); the use of any other type of batteries, such as nickel-cadmium batteries is expressly prohibited.

4. Reference Certification

This EMR certification is based on a certification for the P-3500 Digital Strain Indicator issued by the United States Mine Safety and Health Administration (MSHA), approval number 2G-3533-0. Any modifications to the apparatus certified by MSHA in respect of the preceding certification

continued...

numbers, which result in the issuance of additional certification documentation by MSHA must also be reported to EMR if such modified apparatus is also intended to be EMR certified. Similarly, if for any reason the above certificate is modified, rescinded or otherwise changed by MSHA, EMR shall be notified by the certificate holder of such change.

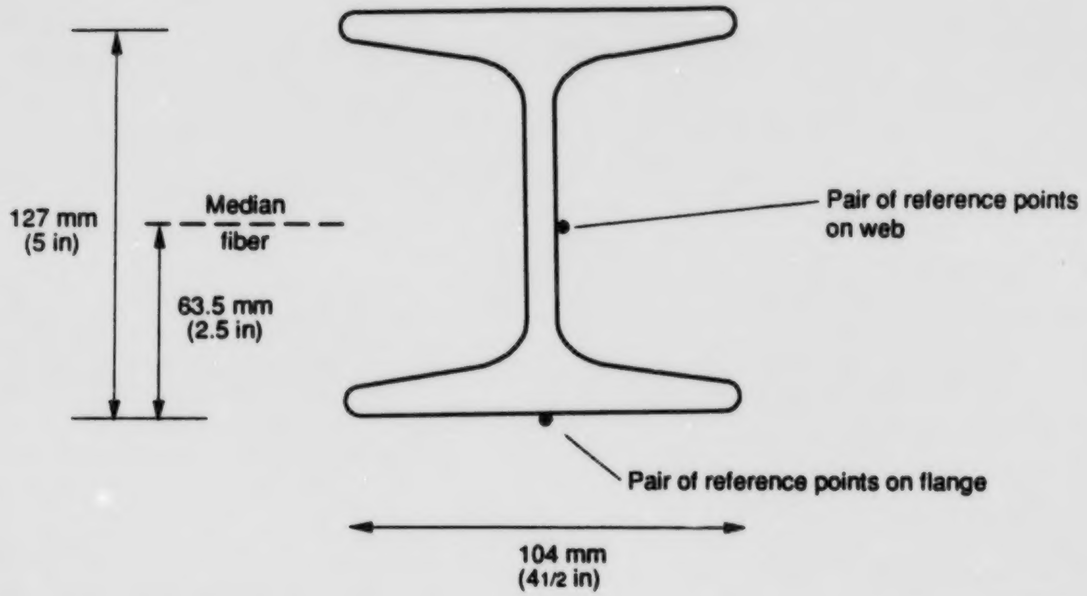
5. Drawing List and Product Specifications

Drawing No.	Description	Revision
400-052775G	Schematic - P3500	-
EMR-1	Schematic - 5 channel switching and connection unit	-

APPENDIX 2

FORMULAE FOR INTERPRETATION OF STRAIN MEASUREMENTS IN STEEL SETS

Strain measurements were on "H" section steel beams shown below and manufactured by British Steel Corporation.



Since readings of the mechanical strain gauge used in the trial were in 0.0001 in, the english system of units will be used for intermediate calculations and the final results will be converted in the S.I. system of units.

The formulae used are presented in Choquet (1982). They are standard formulae to be found in any textbook on the principles of strength of materials, more specifically in chapters dealing with beam bending theory.

Notations used are from Choquet (1982) and are the following. Numerical values are given between brackets, as obtained in literature of the steel beam manufacturer, or cited elsewhere in the report.

I = moment of inertia of steel beam (24.16 in^4 or 1001.10^{-8} m^4)

A = cross-section area (5.88 in^2 or $3.79.10^{-3}$ m^2)

E = Young's modulus of the steel (30.10^6 lb/in^2)

Y_{web} = distance between median fiber of beam and pair of reference points on web (0.0 in)

Y_{flange} = distance between median fiber of beam and pair of reference points on flange (-2.5 in)

ℓ = spacing between reference points of the same pair (10 in)

$\Delta\ell$ = change in distance between reference points, as measured by the mechanical strain gauge (value in 0.0001 in)

a) FORMULA FOR AXIAL LOAD N

$$N(\mathrm{lb}) = \frac{A \cdot E \cdot (\Delta\ell_{web} \cdot Y_{flange} \cdot \ell - \Delta\ell_{flange} \cdot Y_{web} \cdot \ell)}{\ell \cdot \ell \cdot (Y_{flange} - Y_{web})}$$

$$= \frac{5.88 \times 30.10^{6}(\Delta\ell_{web} \cdot 10^{-4} \times (-2.5) \times 10 - \Delta\ell_{flange} \cdot 10^{-4} \times 0 \times 10)}{10 \times 10 \times (-2.5)}$$

$$N(\mathrm{lb}) = 1764 \times \Delta\ell_{web}$$

$$\boxed{N(\mathrm{kN}) = 7.84 \times \Delta\ell_{web}}$$

($N < 0$, i.e. compressive axial load)

b) FORMULA FOR BENDING MOMENT M

$$M(\mathrm{lb \cdot po}) = \frac{E \cdot I \cdot (\Delta\ell_{web} \cdot \ell - \Delta\ell_{flange} \cdot \ell)}{\ell \cdot \ell \cdot (Y_{flange} - Y_{web})}$$

$$= \frac{30.10^{6} \times 24.16(\Delta\ell_{web} \cdot 10^{-4} \times 10 - \Delta\ell_{flange} \cdot 10^{-4} \times 10)}{10.10(-2.5)}$$

$$M(\mathrm{lb \cdot po}) = 2900(\Delta\ell_{web} - \Delta\ell_{flange})$$

$$\boxed{M(\mathrm{kN \cdot m}) = 0.327(\Delta\ell_{web} - \Delta\ell_{flange})}$$

c) FORMULA FOR MAXIMUM STRESS IN STEEL

$$\sigma_{max}(\mathrm{lb/in^2}) = \frac{N}{A} - \left|\frac{M \cdot Y_{flange}}{I}\right|$$

$$= \frac{N(\mathrm{lb})}{5.88} - \left|\frac{M(\mathrm{lb \cdot po}) \cdot (-2.5)}{24.16}\right|$$

$$\sigma_{max}(\mathrm{lb/in^2}) = 0.170 \times N(\mathrm{lb}) - \left|0.103 \times M(\mathrm{lb \cdot po})\right|$$

$$\boxed{\sigma_{max}(\mathrm{MPa}) = 0.263 \times N(\mathrm{kN}) - \left|6.344 \times M(\mathrm{kN \cdot m})\right|}$$

d) CORRECTION OF MECHANICAL STRAIN GAUGE READINGS FOR INFLUENCE OF TEMPERATURE

The linear coefficient of expansion of steel α is in the range of $\alpha = 11 \cdot 10^{-6}$ per degree Celsius, and the well-known formula for the strain ε due to change in temperature is the following.

$\varepsilon = \alpha(T-T_o)$, where $T-T_o$ is the change in temperature from T_o (degree Celsius) to T (degree Celsius)

Therefore,

$$\varepsilon = \frac{\Delta\ell}{\ell} = \alpha(T-T_o)$$

$$\Delta\ell = 10 \times 11 \cdot 10^{-6}\,(T-T_o)$$

$$\boxed{\Delta\ell = 1.1 \cdot 10^{-4}\,(T-To)}$$

The readings of the mechanical strain gauge must be corrected by $-1.1 \cdot 10^{-4}$ in per degree Celsius of increase of temperature.

APPENDIX 3

DATA SHEETS

TEST SITE NO. 1
(BETWEEN STEEL SETS 631 AND 691)
BOTTOM GATEROAD
2 WEST PANEL
PHALEN MINE

TEST SITE NO.1, PHALEN MINE
CABLE SLINGS

Face # Support	Day Number	Tensmag gage 1 Sling 653.5	Tensmag gage 2 Sling 657.5	Tensmag gage 3 Sling 661.5	Tensmag gage 4 Sling 666.5	Tensmag gage 5 Sling 669.5
280	17.5	-5150.0	-8253.0	-10768.0	-13166.0	-15466.0
280	17.5	-3651.0	-7288.0	-9655.0	-12271.0	-14402.0
280	17.7	-3815.0	-7416.0	-9809.0	-12396.0	-14583.0
285	18.5	-3897.0	-7455.0	-9874.0	-12566.0	-14653.0
291	19.5	-3895.0	-7441.0	-9864.0	-12569.0	-14706.0
317	60.0	-4202.0	-7697.0	-10063.0	-12739.0	-14817.0
319	64.0					
346	67.0	-4222.0	-7712.0	-10072.0	-12740.0	[illegible]
360	72.0					
380	78.0					
394	79.0					
401	80.0					
452	92.0	-4156.0	-7636.0	-10019.0	-12696.0	-14772.0
466	94.0	-4154.0	-7637.0	-10021.0	-12706.0	-14780.0
490	100.0	-4164.0	-7648.0	-10019.0	-12692.0	-14764.0
503	102.0	-4090.0	-7464.0	-9914.0	-12678.0	-14760.0
530	108.0	-4059.0	-7560.0	-9940.0	-12628.0	-14702.0
536	110.0	-4118.0	-7607.0	-9976.0	-12655.0	-14718.0
544	114.0	4063.0	-7565.0	-9945.0	-12627.0	-14695.0
555	116.0	-4072.0	-7582.0	-9956.0	-12633.0	-14693.0
567	121.0	-3997.0	-7520.0	-9910.0	-12587.0	-14654.0
575	123.0	-3884.0	-7473.0	-9840.0	-12525.0	-14603.0
593	127.0	-3930.0	-7490.0	-9800.0	-12501.0	-14639.0
606	129.0	-3862.0	-7424.0	-9793.0	-12503.0	-14558.0
611	130.0	-3787.0	-7338.0	-9747.0	-12473.0	-14532.0
624	134.0	-3717.0	-7263.0	[illegible]	-12476.0	-14485.0
630	135.7	-3669.0	-7217.0	-9562.0	-12475.0	-14448.0
630	135.7	-3672.9	-7218.0	-9561.0	-12474.0	-14446.0
630	135.9	-3671.0	-7215.0	-9556.0	-12458.0	-14473.0
630	136.0	-3671.0	-7215.0	-9550.0	-12458.0	-14473.0
632	136.1	-3666.0	-7212.0	-9546.0	-12446.0	-14445.0
632	136.7	-3663.0	-7199.0	-9524.0	-12436.0	-14423.0
632	136.9	-3651.0	-7187.0	-9523.0	-12438.0	-14419.0
633	137.1	-3650.0	-7186.0	-9517.0	-12438.0	-14413.0
634	137.7	-3661.0	-7193.0	-9517.0	-12438.0	-14405.0
635	137.8	-3659.0	-7192.0	-9519.0	-12438.0	-14402.0
637	138.0	-3643.0	-7183.0	-9501.0	-12422.0	-14395.0
638	138.1	-3628.0	-7177.0	-9480.0	-12415.0	-14381.0
642	138.4	-3622.0	-7168.0	-9472.0	-12406.0	-14373.0
642	138.7	-3625.0	-7161.0	-9462.0	-12401.0	-14377.0
644	138.9	-3638.0	-7163.0	-9442.0	-12392.0	-14367.0
644	138.9	-3633.0	-7153.0	-9436.0	-12386.0	-14361.0
644	138.9	-3638.0	-7155.0	-9435.0	-12377.0	-14364.0
645	142.3	-3608.0	-7143.0	-9429.0	-12395.0	-14369.0
648	142.5	-3660.0	-7121.0	-9405.0	-12373.0	-14354.0
649	142.7	-3627.0	-7085.0	-9376.0	-12353.0	-14333.0
649	142.8	-3624.0	-7085.0	-9372.0	-12349.0	-14330.0
651	142.9	-3585.0	-7047.0	-9348.0	-12335.0	-14315.0
651	142.9	-3585.0	-7044.0	-9345.0	-12329.0	-14312.0

Face # Support	Day Number	Tensmag gage 1 Sling 653.5	Tensmag gage 2 Sling 657.5	Tensmag gage 3 Sling 661.5	Tensmag gage 4 Sling 666.5	Tensmag gage 5 Sling 669.5
651	143.4	-3578.0	-7019.0	-9330.0	-12320.0	-14298.0
651	143.5	-3640.0	-6999.0	-9320.0	-12310.0	-14303.0
652	143.5	-3642.0	-6998.0	-9320.0	-12306.0	-14303.0
654	143.8	-3863.0	-6901.0	-9269.0	-12279.0	-14286.0
655	143.9	-4193.0	-6815.0	-9202.0	-12245.0	-14267.0
657	144.3	-3986.0	-6765.0	-9382.0	-12219.0	-14284.0
657	144.4	-4445.0	-6767.0	-9386.0	-12227.0	-14262.0
657	144.4	-4259.0	-6708.0	-9363.0	-12227.0	-14262.0
657	144.4	-4240.0	-6704.0	-9360.0	-12227.0	-14062.0
657	144.4	-4308.0	-6714.0	-9353.0	-12224.0	-14260.0
657	144.4	-4401.0	-6726.0	-9357.0	-12223.0	-14259.0
657	144.4	-4235.0	-6723.0	-9356.0	-12224.0	-14262.0
657	144.4	-4120.0	-6725.0	-9355.0	-12223.0	-14261.0
657	144.5	-3987.0	-6691.0	-9308.0	-12256.0	-14248.0
657	144.5	-4051.0	-6688.0	-9307.0	-12204.0	-14248.0
657	144.5	-4226.0	-6684.0	-9299.0	-12204.0	-14246.0
657	144.5	-4029.0	-6625.0	-9284.0	-12196.0	-14244.0
657	144.5	-4208.0	-6634.0	-9280.0	-12195.0	-14248.0
657	144.5	-4417.0	-6614.0	-9263.0	-12189.0	-14238.0
657	144.5	-4800.0	-6637.0	-9245.0	-12180.0	-14236.0
657	144.6	-4644.0	-6687.0	-9249.0	-12182.0	-14235.0
659	144.7	-4978.0	-7092.0	-9220.0	-12160.0	-14223.0
659	144.7	-4787.0	-6489.0	-9058.0	-12093.0	-14191.0
659	144.7	-5051.0	-6529.0	-9095.0	-12099.0	-14190.0
661	144.8	-4943.0	-6272.0	[illegible]	-12081.0	-14181.0
661	144.8	-3900.0	-5614.0	[illegible]	-12001.0	-14149.0
663	144.8	-4942.0	-6076.0	-9206.0	-11999.0	-14152.0
663	144.9	-5021.0	-5563.0	[illegible]	-11992.0	-14135.0
663	144.9	-4978.0	-5291.0	-8667.0	-11918.0	-14129.0
664	145.4	-2796.0	-7108.0	-9145.0	-11870.0	-14088.0
664	145.4	-2770.0	-7675.0	-9187.0	-11854.0	-14073.0
665	145.5	-2207.0	-7567.0	-8879.0	-11668.0	-14025.0
666	145.8	-1468.0	-7368.0	-9900.0	-11807.0	-13999.0
666	145.8	-1427.0	-7282.0	-9922.0	-11818.0	-13998.0
667	145.8	-1620.0	-7246.0	-10320.0	-11654.0	-13964.0
667	145.8	-1295.0		-10815.0	-10673.0	-14032.0
667	145.9	-4656.0		-10846.0	-10972.0	-14069.0
669	147.0	-485.0		-10112.0	-9799.0	-14019.0
670	148.1	799.0		-10772.0	-10728.0	-13839.0
672	148.2	265.0		-8938.0	-11134.0	-14246.0
674	148.4				-11889.0	-14904.0
676	148.4					-14958.0
676	148.6					-14985.0
676	149.0					-14700.0
676	149.1					-14574.0
678	149.3					-15005.0
681	149.5					-15637.0
682	150.0					-14804.0
682	150.1					-14733.0
684	150.1					-14726.0
684	150.1					-14647.0

(Raw datas)

TEST SITE NO.1, PHALEN MINE
CABLE SLINGS

Face # Support	Day Number	Load (kN) gage 1 Sling 653.5	Load (kN) gage 2 Sling 657.5	Load (kN) gage 3 Sling 661.5	Load (kN) gage 4 Sling 666.5	Load (kN) gage 5 Sling 669.5
280	17.5	0	0.0	0.0	0.0	0.0
286	17.5	28.225	24.607	20.382	22.822	27.1
280	17.7	24.643	21.344	24.455	19.635	23.5
285	18.5	21.952	20.349	22.797	15.200	20.7
291	19.5	22.403	20.706	23.452	15.224	19.4
317	60.0	24.178	14.178	17.978	10.888	16.5
319	64.0					
346	67.0	23.664	13.795	17.749	10.863	16.7
360	72.0					
380	78.0					
394	79.0					
401	80.0					
452	92.0	25.347	15.734	19.100	11.985	17.7
466	94.0	25.398	15.708	19.640	11.720	17.5
490	100.0	25.103	15.427	19.100	12.087	17.9
503	102.0	27.030	24.120	21.777	12.444	18.0
530	108.0	27.021	17.671	21.114	12.719	19.5
526	110.6	26.316	16.473	20.196	13.031	19.1
544	114.0	27.719	17.584	20.987	13.744	19.7
555	116.0	27.489	17.111	20.706	12.592	19.7
567	121.0	29.462	18.487	21.879	14.764	20.7
575	123.0	32.283	20.859	22.664	16.345	22.0
593	127.0	30.946	19.252	22.542	14.917	21.1
606	129.0	32.084	21.179	24.862	16.906	23.2
611	130.0	24.756	22.822	26.076	17.671	22.8
624	134.0	26.542	25.245	29.227	17.598	25.0
630	135.7	27.765	26.418	29.757	17.621	26.0
630	135.7	27.689	26.393	30.778	17.646	26.0
630	135.9	27.715	26.469	31.459	18.054	25.3
630	136.0	27.715	26.469	31.459	18.054	25.3
632	136.1	27.842	26.545	31.161	18.260	26.0
632	136.7	27.918	26.677	31.467	18.615	26.6
632	136.9	28.225	27.183	31.748	18.564	26.7
633	137.1	28.250	27.248	31.900	18.564	26.9
634	137.7	27.970	27.036	31.900	18.564	27.1
635	137.8	28.021	27.056	31.850	18.564	27.1
637	138.0	28.429	27.285	32.240	18.972	27.3
638	138.1	29.011	27.470	32.644	19.156	27.7
642	138.4	28.964	27.667	33.040	19.280	27.9
642	138.7	28.887	27.846	33.303	19.508	27.9
644	138.9	28.556	27.795	33.707	19.737	28.0
644	138.9	28.665	28.050	33.966	19.890	28.2
644	138.9	28.556	27.999	33.491	20.120	28.1
645	142.3	27.281	28.305	34.145	19.961	28.0
648	142.5	27.995	28.866	34.756	20.222	28.4
649	142.7	28.837	29.784	35.496	20.731	28.9
649	142.8	28.913	29.784	35.598	20.832	29.0
651	142.9	29.906	30.753	36.210	21.191	29.4
651	142.9	29.908	30.870	36.287	21.344	29.4

Face # Support	Day Number	Load (kN) gage 1 Sling 653.5	Load (kN) gage 2 Sling 657.5	Load (kN) gage 3 Sling 661.5	Load (kN) gage 4 Sling 666.5	Load (kN) gage 5 Sling 669.5
651	143.4	40.086	31.467	36.669	21.573	29.5
651	143.5	38.505	32.237	36.022	21.828	29.7
652	143.5	38.454	32.360	36.920	21.930	29.7
654	143.8	32.819	34.476	38.225	22.618	30.1
655	143.9	24.463	36.669	38.913	23.486	30.6
657	144.3	29.784	37.944	35.343	24.109	31.2
657	144.4	17.970	37.893	35.394	23.944	30.7
657	144.4	22.720	39.370	35.828	23.944	30.7
657	144.4	21.675	39.500	35.904	23.944	35.0
657	144.4	21.471	39.244	36.082	24.021	30.0
657	144.4	19.100	38.683	35.981	24.046	30.0
657	144.4	23.333	39.015	36.006	24.021	30.7
657	144.4	26.265	38.964	36.032	24.046	30.7
657	144.5	29.656	39.031	37.230	23.205	31.1
657	144.5	28.025	34.000	37.256	24.531	31.1
657	144.5	27.562	40.609	37.460	24.531	31.1
657	144.5	28.586	41.514	37.842	24.735	31.2
657	144.5	24.021	41.208	37.944	24.760	31.1
657	144.5	18.691	41.795	38.378	24.914	31.3
657	144.5	6.085	41.208	38.637	25.143	31.4
657	144.6	7.003	39.932	38.735	25.092	31.4
659	144.7	5.406	29.606	39.474	25.653	31.7
659	144.7	9.256	44.982	43.605	27.362	32.5
659	144.7	2.524	43.962	42.662	27.208	32.5
661	144.8	5.126	50.515	[illegible]	27.667	32.8
661	144.8	31.075	67.295	24.147	29.700	33.6
663	144.8	5.364	55.513	37.444	29.750	33.5
663	144.9	3.290	68.595	48.969	31.212	33.9
663	144.9	4.386	75.531	53.696	31.820	34.1
664	145.4	44.829	29.197	41.287	32.140	35.1
664	145.4	45.390	14.739	40.316	33.456	35.5
665	145.5	75.047	17.093	50.360	38.199	36.7
666	145.8	97.891	22.772	22.178	34.655	37.4
666	145.8	94.937	24.766	21.573	34.374	37.4
667	145.6	90.015	7.982	11.424	38.556	38.3
667	145.8	47.302		-1.190	63.571	36.6
667	145.9	12.756		-1.909	55.947	35.6
669	147.0	118.958		16.728	25.858	36.9
670	148.1	121.151		-46.102	62.169	41.5
672	148.2	126.552		46.665	26.716	31.1
674	148.4				22.564	12.3
676	148.4					13.9
676	148.6					12.7
676	149.0					18.5
676	149.1					22.7
678	149.3					11.8
681	149.5					16.9
682	150.0					16.9
682	150.1					18.7
684	150.1					16.9
684	150.1					20.9

(Converted datas, as plotted on graphs, y-axis)

TEST SITE NO.1, PHALEN MINE

Distance between slings and longwall face (m)

Face # Support	Day Number	Sling 653.5	Sling 657.5	Sling 661.5	Sling 666.5	Sling 669.5
280	17.5	-569.36	-575.46	-581.55	-589.18	-593.75
280	17.5	-569.36	-575.46	-581.55	-589.18	-593.75
280	17.7	-569.36	-575.46	-581.55	-589.18	-593.75
285	18.5	-561.74	-567.84	-573.93	-581.55	-586.13
291	19.5	-552.59	-558.69	-564.79	-572.41	-576.98
317	60.0	-512.96	-519.05	-525.15	-532.77	-537.35
319	64.0	-509.91	-516.01	-522.10	-529.73	-534.30
346	67.0	-468.75	-474.85	-480.95	-488.57	-493.14
360	72.0	-447.41	-453.51	-459.60	-467.23	-471.80
388	78.0	-404.73	-410.82	-416.92	-424.54	-429.12
394	79.0	-395.58	-401.68	-407.77	-415.40	-419.97
401	86.0	-384.91	-391.01	-397.10	-404.73	-409.30
452	92.0	-307.16	-313.26	-319.36	-326.98	-331.55
466	98.0	-285.82	-291.92	-298.02	-305.64	-310.21
490	100.0	-249.24	-255.34	-261.43	-269.05	-273.63
503	102.0	-229.42	-235.52	-241.62	-249.24	-253.81
530	108.0	-188.26	-194.36	-200.46	-208.08	-212.65
536	110.0	-179.12	-185.21	-191.31	-198.93	-203.51
544	114.0	-166.92	-173.02	-179.12	-186.74	-191.31
555	116.0	-150.15	-156.25	-162.35	-169.97	-174.54
567	121.0	-131.86	-137.96	-144.05	-151.68	-156.25
575	123.0	-119.66	-125.76	-131.86	-139.48	-144.05
593	127.0	-92.23	-98.32	-104.42	-112.04	-116.62
606	129.0	-72.41	-78.51	-84.60	-92.23	-96.80
611	130.0	-64.79	-70.88	-76.98	-84.60	-89.18
624	134.0	-44.97	-51.07	-57.16	-64.79	-69.36
630	135.7	-35.82	-41.92	-48.02	-55.64	-60.21
630	135.7	-35.82	-41.92	-48.02	-55.64	-60.21
630	135.9	-35.82	-41.92	-48.02	-55.64	-60.21
630	136.0	-35.82	-41.92	-48.02	-55.64	-60.21
632	136.1	-32.77	-38.87	-44.97	-52.59	-57.16
632	136.7	-32.77	-38.87	-44.97	-52.59	-57.16
632	136.9	-32.77	-38.87	-44.97	-52.59	-57.16
633	137.1	-31.25	-37.35	-43.45	-51.07	-55.64
634	137.7	-29.73	-35.82	-41.92	-49.54	-54.12
635	137.8	-28.20	-34.30	-40.40	-48.02	-52.59
637	138.0	-25.15	-31.25	-37.35	-44.97	-49.54
638	138.1	-23.63	-29.73	-35.82	-43.45	-48.02
642	138.4	-17.53	-23.63	-29.73	-37.35	-41.92
642	138.7	-17.53	-23.63	-29.73	-37.35	-41.92
644	138.9	-14.48	-20.58	-26.68	-34.30	-38.87
644	138.9	-14.48	-20.58	-26.68	-34.30	-38.87
644	138.9	-14.48	-20.58	-26.68	-34.30	-38.87
645	142.3	-12.96	-19.05	-25.15	-32.77	-37.35
648	142.5	-8.38	-14.48	-20.58	-28.20	-32.77
649	142.7	-6.86	-12.96	-19.05	-26.68	-31.25
649	142.8	-6.86	-12.96	-19.05	-26.68	-31.25
651	142.9	-3.81	-9.91	-16.01	-23.63	-28.20
651	142.9	-3.81	-9.91	-16.01	-23.63	-28.20
651	143.4	-3.81	-9.91	-16.01	-23.63	-28.20
651	143.5	-3.81	-9.91	-16.01	-23.63	-28.20
652	143.5	-2.29	-8.38	-14.48	-22.10	-26.68

Face # Support	Day Number	Sling 653.5	Sling 657.5	Sling 661.5	Sling 666.5	Sling 669.5
654	143.8	0.76	-5.34	-11.43	-19.05	-23.63
655	143.9	2.29	-3.81	-9.91	-17.53	-22.10
657	144.3	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.4	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.5	5.34	-0.76	-6.86	-14.48	-19.05
657	144.6	5.34	-0.76	-6.86	-14.48	-19.05
659	144.7	8.38	2.29	-3.81	-11.43	-16.01
659	144.7	8.38	2.29	-3.81	-11.43	-16.01
659	144.7	8.38	2.29	-3.81	-11.43	-16.01
661	144.8	11.43	5.34	-0.76	-8.38	-12.96
661	144.8	11.43	5.34	-0.76	-8.38	-12.96
663	144.8	14.48	8.38	2.29	-5.34	-9.91
663	144.9	14.48	8.38	2.29	-5.34	-9.91
663	144.9	14.48	8.38	2.29	-5.34	-9.91
664	145.4	16.01	9.91	3.81	-3.81	-8.38
664	145.4	16.01	9.91	3.81	-3.81	-8.38
665	145.5	17.53	11.43	5.34	-2.29	-6.86
666	145.8	19.05	12.96	6.86	-0.76	-5.34
666	145.8	19.05	12.96	6.86	-0.76	-5.34
667	145.8	20.58	14.48	8.38	0.76	-3.81
667	145.8	20.58	14.48	8.38	0.76	-3.81
667	145.9	20.58	14.48	8.38	0.76	-3.81
669	147	23.63	17.53	11.43	3.81	-0.76
670	148.1	25.15	19.05	12.96	5.34	0.76
672	148.2	28.20	22.10	16.01	8.38	3.81
674	148.4	31.25	25.15	19.05	11.43	6.86
676	148.4	34.30	28.20	22.10	14.48	9.91
676	148.6	34.30	28.20	22.10	14.48	9.91
676	149	34.30	28.20	22.10	14.48	9.91
676	149.1	34.30	28.20	22.10	14.48	9.91
678	149.3	37.35	31.25	25.15	17.53	12.96
681	149.5	41.92	35.82	29.73	22.10	17.53
682	150	43.45	37.35	31.25	23.63	19.05
682	150.1	43.45	37.35	31.25	23.63	19.05
684	150.1	46.49	40.40	34.30	26.68	22.10
684	150.1	46.49	40.40	34.30	26.68	22.10
684	150.1	46.49	40.40	34.30	26.68	22.10
687	150.4	51.07	44.97	38.87	31.25	26.68
688	150.5	52.59	46.49	40.40	32.77	28.20
688	150.5	52.59	46.49	40.40	32.77	28.20
688	150.6	52.59	46.49	40.40	32.77	28.20
690	151	55.64	49.54	43.45	35.82	31.25

(Plotted on graphs, x-axis,

values to be multiplied by 0.656)

TEST SITE NO.1, PHALEN MINE
Distance from longwall face (m)

Face # Support	Dev Number	Gage 631	Gage 635	Gage 639	Gage 644	Gage 649	Gage 653	Gage 657	Gage 661	Gage 666	Gage 669	Gage 675	Gage 679	Gage 683	Gage 687	Gage 691
280	17.0	-535.06	-541.16	-547.26	-554.88	-562.50	-568.60	-574.70	-580.79	-588.41	-592.99	-602.13	-608.23	-614.33	-620.43	-626.52
285	18.5	-527.44	-533.54	-539.63	-547.26	-554.88	-560.98	-567.07	-573.17	-580.79	-585.37	-594.51	-600.61	-606.71	-612.80	-618.90
291	19.4	-518.29	-524.39	-530.49	-538.11	-545.73	-551.83	-557.93	-564.02	-571.65	-576.22	-585.37	-591.46	-597.56	-603.66	-609.76
317	60.4	-478.66	-484.76	-490.85	-498.48	-506.10	-512.20	-518.29	-524.39	-532.01	-536.59	-545.73	-551.83	-557.93	-564.02	-570.12
319	64.4	-475.61	-481.71	-487.80	-495.43	-503.05	-509.15	-515.24	-521.34	-528.96	-533.54	-542.68	-548.78	-554.88	-560.98	-567.07
346	67.4	-434.45	-440.55	-446.65	-454.27	-461.89	-467.99	-474.09	-480.18	-487.80	-492.38	-501.52	-507.62	-513.72	-519.82	-525.91
360	72.4	-413.11	-419.21	-425.30	-432.93	-440.55	-446.65	-452.74	-458.84	-466.46	-471.04	-480.18	-486.28	-492.38	-498.48	-504.57
388	78.3	-370.43	-376.52	-382.62	-390.24	-397.87	-403.96	-410.06	-416.16	-423.78	-428.35	-437.50	-443.60	-449.70	-455.79	-461.89
394	79.3	-361.28	-367.38	-373.48	-381.10	-388.72	-394.82	-400.91	-407.01	-414.63	-419.21	-428.35	-434.45	-440.55	-446.65	-452.74
401	80.4	-350.61	-356.71	-362.80	-370.43	-378.05	-384.15	-390.24	-396.34	-403.96	-408.54	-417.68	-423.78	-429.88	-435.98	-442.07
452	92.4	-272.87	-278.96	-285.06	-292.68	-300.30	-306.40	-312.50	-318.60	-326.22	-330.79	-339.94	-346.04	-352.13	-358.23	-364.33
466	94.5	-251.52	-257.62	-263.72	-271.34	-278.96	-285.06	-291.16	-297.26	-304.88	-309.45	-318.60	-324.70	-330.79	-336.89	-342.99
490	100.4	-214.94	-221.04	-227.13	-234.76	-242.38	-248.48	-254.57	-260.67	-268.29	-272.87	-282.01	-288.11	-294.21	-300.30	-306.40
503	102.4	-195.12	-201.22	-207.32	-214.94	-222.56	-228.66	-234.76	-240.85	-248.48	-253.05	-262.20	-268.29	-274.39	-280.49	-286.59
520	108.4	-153.96	-160.06	-166.16	-173.78	-181.40	-187.50	-193.60	-199.70	-207.32	-211.89	-221.04	-227.13	-233.23	-239.33	-245.43
536	110.0	-144.82	-150.91	-157.01	-164.63	-172.26	-178.35	-184.45	-190.55	-198.17	-202.74	-211.89	-217.99	-224.09	-230.18	-236.28
544	114.4	-132.62	-138.72	-144.82	-152.44	-160.06	-166.16	-172.26	-178.35	-185.98	-190.55	-199.70	-205.79	-211.89	-217.99	-224.09
555	116.4	-115.85	-121.95	-128.05	-135.67	-143.29	-149.39	-155.49	-161.59	-169.21	-173.78	-182.93	-189.02	-195.12	-201.22	-207.32
567	121.5	-97.56	-103.66	-109.76	-117.38	-125.00	-131.10	-137.20	-143.29	-150.91	-155.49	-164.63	-170.73	-176.83	-182.93	-189.02
575	123.4	-85.37	-91.46	-97.56	-105.18	-112.80	-118.90	-125.00	-131.10	-138.72	-143.29	-152.44	-158.54	-164.63	-170.73	-176.83
593	127.4	-57.93	-64.02	-70.12	-77.74	-85.37	-91.46	-97.56	-103.66	-111.28	-115.85	-125.00	-131.10	-137.20	-143.29	-149.39
606	129.4	-38.11	-44.21	-50.30	-57.93	-65.55	-71.65	-77.74	-83.84	-91.46	-96.04	-105.18	-111.28	-117.38	-123.48	-129.57
611	130.4	-30.49	-36.59	-42.68	-50.30	-57.93	-64.02	-70.12	-76.22	-83.84	-88.41	-97.56	-103.66	-109.76	-115.85	-121.95
624	134.4	-10.67	-16.77	-22.87	-30.49	-38.11	-44.21	-50.30	-56.40	-64.02	-68.60	-77.74	-83.84	-89.94	-96.04	-102.13
630	135.7	-1.52	-7.62	-13.72	-21.34	-28.96	-35.06	-41.16	-47.26	-54.88	-59.45	-68.60	-74.70	-80.79	-86.89	-92.99
630	135.7	-1.52	-7.62	-13.72	-21.34	-28.96	-35.06	-41.16	-47.26	-54.88	-59.45	-68.60	-74.70	-80.79	-86.89	-92.99
630	135.9	-1.52	-7.62	-13.72	-21.34	-28.96	-35.06	-41.16	-47.26	-54.88	-59.45	-68.60	-74.70	-80.79	-86.89	-92.99
630	136.0	-1.52	-7.62	-13.72	-21.34	-28.96	-35.06	-41.16	-47.26	-54.88	-59.45	-68.60	-74.70	-80.79	-86.89	-92.99
632	136.1	1.52	-4.57	-10.67	-18.29	-25.91	-32.01	-38.11	-44.21	-51.83	-56.40	-65.55	-71.65	-77.74	-83.84	-89.94
632	136.7	1.52	-4.57	-10.67	-18.29	-25.91	-32.01	-38.11	-44.21	-51.83	-56.40	-65.55	-71.65	-77.74	-83.84	-89.94
632	136.9	1.52	-4.57	-10.67	-18.29	-25.91	-32.01	-38.11	-44.21	-51.83	-56.40	-65.55	-71.65	-77.74	-83.84	-89.94
633	137.1	3.05	-3.05	-9.15	-16.77	-24.39	-30.49	-36.59	-42.68	-50.30	-54.88	-64.02	-70.12	-76.22	-82.32	-88.41
634	137.7	4.57	-1.52	-7.62	-15.24	-22.87	-28.96	-35.06	-41.16	-48.78	-53.35	-62.50	-68.60	-74.70	-80.79	-86.89
635	137.8	6.10	0.00	-6.10	-13.72	-21.34	-27.44	-33.54	-39.63	-47.26	-51.83	-60.98	-67.07	-73.17	-79.27	-85.37
637	138.0	9.15	3.05	-3.05	-10.67	-18.29	-24.39	-30.49	-36.59	-44.21	-48.78	-57.93	-64.02	-70.12	-76.22	-82.32
638	138.1	10.67	4.57	-1.52	-9.15	-16.77	-22.87	-28.96	-35.06	-42.68	-47.26	-56.40	-62.50	-68.60	-74.70	-80.79
642	138.4	16.77	10.67	4.57	-3.05	-10.67	-16.77	-22.87	-28.96	-36.59	-41.16	-50.30	-56.40	-62.50	-68.60	-74.70
642	138.7	16.77	10.67	4.57	-3.05	-10.67	-16.77	-22.87	-28.96	-36.59	-41.16	-50.30	-56.40	-62.50	-68.60	-74.70
644	138.9	19.82	13.72	7.62	0.00	-7.62	-13.72	-19.82	-25.91	-33.54	-38.11	-47.26	-53.35	-59.45	-65.55	-71.65
644	138.9	19.82	13.72	7.62	0.00	-7.62	-13.72	-19.82	-25.91	-33.54	-38.11	-47.26	-53.35	-59.45	-65.55	-71.65
644	138.9	19.82	13.72	7.62	0.00	-7.62	-13.72	-19.82	-25.91	-33.54	-38.11	-47.26	-53.35	-59.45	-65.55	-71.65
645	142.3	21.34	15.24	9.15	1.52	-6.10	-12.20	-18.29	-24.39	-32.01	-36.59	-45.73	-51.83	-57.93	-64.02	-70.12
648	142.5	25.91	19.82	13.72	6.10	-1.52	-7.62	-13.72	-19.82	-27.44	-32.01	-41.16	-47.26	-53.35	-59.45	-65.55
649	142.7	27.44	21.34	15.24	7.62	0.00	-6.10	-12.20	-18.29	-25.91	-30.49	-39.63	-45.73	-51.83	-57.93	-64.02
649	142.8	27.44	21.34	15.24	7.62	0.00	-6.10	-12.20	-18.29	-25.91	-30.49	-39.63	-45.73	-51.83	-57.93	-64.02
651	142.9	30.49	24.39	18.29	10.67	3.05	-3.05	-9.15	-15.24	-22.87	-27.44	-36.59	-42.68	-48.78	-54.88	-60.98
651	142.9	30.49	24.39	18.29	10.67	3.05	-3.05	-9.15	-15.24	-22.87	-27.44	-36.59	-42.68	-48.78	-54.88	-60.98
651	143.4	30.49	24.39	18.29	10.67	3.05	-3.05	-9.15	-15.24	-22.87	-27.44	-36.59	-42.68	-48.78	-54.88	-60.98
651	143.5	30.49	24.39	18.29	10.67	3.05	-3.05	-9.15	-15.24	-22.87	-27.44	-36.59	-42.68	-48.78	-54.88	-60.98
652	143.5	32.01	25.91	19.82	12.20	4.57	-1.52	-7.62	-13.72	-21.34	-25.91	-35.06	-41.16	-47.26	-53.35	-59.45
654	143.8	35.06	28.96	22.87	15.24	7.62	1.52	-4.57	-10.67	-18.29	-22.87	-32.01	-38.11	-44.21	-50.30	-56.40
655	143.9	36.59	30.49	24.39	16.77	9.15	3.05	-3.05	-9.15	-16.77	-21.34	-30.49	-36.59	-42.68	-48.78	-54.88

Face # Support	Dev Number	Gage 631	Gage 635	Gage 639	Gage 644	Gage 649	Gage 653	Gage 657	Gage 661	Gage 666	Gage 669	Gage 675	Gage 679	Gage 683	Gage 687	Gage 691
657	144.3	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.4	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.5	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
657	144.6	39.63	33.54	27.44	19.82	12.20	6.10	0.00	-6.10	-13.72	-18.29	-27.44	-33.54	-39.63	-45.73	-51.83
659	144.7	42.68	36.59	30.49	22.87	15.24	9.15	3.05	-3.05	-10.67	-15.24	-24.39	-30.49	-36.59	-42.68	-48.78
659	144.7	42.68	36.59	30.49	22.87	15.24	9.15	3.05	-3.05	-10.67	-15.24	-24.39	-30.49	-36.59	-42.68	-48.78
659	144.7	42.68	36.59	30.49	22.87	15.24	9.15	3.05	-3.05	-10.67	-15.24	-24.39	-30.49	-36.59	-42.68	-48.78
661	144.8	45.73	39.63	33.54	25.91	18.29	12.20	6.10	0.00	-7.62	-12.20	-21.34	-27.44	-33.54	-39.63	-45.73
661	144.8	45.73	39.63	33.54	25.91	18.29	12.20	6.10	0.00	-7.62	-12.20	-21.34	-27.44	-33.54	-39.63	-45.73
663	144.8	48.78	42.68	36.59	28.96	21.34	15.24	9.15	3.05	-4.57	-9.15	-18.29	-24.39	-30.49	-36.59	-42.68
663	144.9	48.78	42.68	36.59	28.96	21.34	15.24	9.15	3.05	-4.57	-9.15	-18.29	-24.39	-30.49	-36.59	-42.68
663	144.9	48.78	42.68	36.59	28.96	21.34	15.24	9.15	3.05	-4.57	-9.15	-18.29	-24.39	-30.49	-36.59	-42.68
664	145.4	50.30	44.21	38.11	30.49	22.87	16.77	10.67	4.57	-3.05	-7.62	-16.77	-22.87	-28.96	-35.06	-41.16
664	145.4	50.30	44.21	38.11	30.49	22.87	16.77	10.67	4.57	-3.05	-7.62	-16.77	-22.87	-28.96	-35.06	-41.16
665	145.5	51.83	45.73	39.63	32.01	24.39	18.29	12.20	6.10	-1.52	-6.10	-15.24	-21.34	-27.44	-33.54	-39.63
666	145.8	53.35	47.26	41.16	33.54	25.91	19.82	13.72	7.62	0.00	-4.57	-13.72	-19.82	-25.91	-32.01	-38.11
666	145.8	53.35	47.26	41.16	33.54	25.91	19.82	13.72	7.62	0.00	-4.57	-13.72	-19.82	-25.91	-32.01	-38.11
667	145.8	54.88	48.78	42.68	35.06	27.44	21.34	15.24	9.15	1.52	-3.05	-12.20	-18.29	-24.39	-30.49	-36.59
667	145.8	54.88	48.78	42.68	35.06	27.44	21.34	15.24	9.15	1.52	-3.05	-12.20	-18.29	-24.39	-30.49	-36.59
667	145.9	54.88	48.78	42.68	35.06	27.44	21.34	15.24	9.15	1.52	-3.05	-12.20	-18.29	-24.39	-30.49	-36.59
669	147.0	57.93	51.83	45.73	38.11	30.49	24.39	18.29	12.20	4.57	0.00	-9.15	-15.24	-21.34	-27.44	-33.54
670	148.1	59.45	53.35	47.26	39.63	32.01	25.91	19.82	13.72	6.10	1.52	-7.62	-13.72	-19.82	-25.91	-32.01
672	148.2	62.50	56.40	50.30	42.68	35.06	28.96	22.87	16.77	9.15	4.57	-4.57	-10.67	-16.77	-22.87	-28.96
674	148.4	65.55	59.45	53.35	45.73	38.11	32.01	25.91	19.82	12.20	7.62	-1.52	-7.62	-13.72	-19.82	-25.91
676	148.4	68.60	62.50	56.40	48.78	41.16	35.06	28.96	22.87	15.24	10.67	1.52	-4.57	-10.67	-16.77	-22.87
676	148.6	68.60	62.50	56.40	48.78	41.16	35.06	28.96	22.87	15.24	10.67	1.52	-4.57	-10.67	-16.77	-22.87
676	149.0	68.60	62.50	56.40	48.78	41.16	35.06	28.96	22.87	15.24	10.67	1.52	-4.57	-10.67	-16.77	-22.87
676	149.1	68.60	62.50	56.40	48.78	41.16	35.06	28.96	22.87	15.24	10.67	1.52	-4.57	-10.67	-16.77	-22.87
678	149.3	71.65	65.55	59.45	51.83	44.21	38.11	32.01	25.91	18.29	13.72	4.57	-1.52	-7.62	-13.72	-19.82
681	149.5	76.22	70.12	64.02	56.40	48.78	42.68	36.59	30.49	22.87	18.29	9.15	3.05	-3.05	-9.15	-15.24
682	150.0	77.74	71.65	65.55	57.93	50.30	44.21	38.11	32.01	24.39	19.82	10.67	4.57	-1.52	-7.62	-13.72
682	150.1	77.74	71.65	65.55	57.93	50.30	44.21	38.11	32.01	24.39	19.82	10.67	4.57	-1.52	-7.62	-13.72
684	150.1	80.79	74.70	68.60	60.98	53.35	47.26	41.16	35.06	27.44	22.87	13.72	7.62	1.52	-4.57	-10.67
684	150.1	80.79	74.70	68.60	60.98	53.35	47.26	41.16	35.06	27.44	22.87	13.72	7.62	1.52	-4.57	-10.67
684	150.1	80.79	74.70	68.60	60.98	53.35	47.26	41.16	35.06	27.44	22.87	13.72	7.62	1.52	-4.57	-10.67
687	150.4	85.37	79.27	73.17	65.55	57.93	51.83	45.73	39.63	32.01	27.44	18.29	12.20	6.10	0.00	-6.10
688	150.5	86.89	80.79	74.70	67.07	59.45	53.35	47.26	41.16	33.54	28.96	19.82	13.72	7.62	1.52	-4.57
688	150.5	86.89	80.79	74.70	67.07	59.45	53.35	47.26	41.16	33.54	28.96	19.82	13.72	7.62	1.52	-4.57
688	150.6	86.89	80.79	74.70	67.07	59.45	53.35	47.26	41.16	33.54	28.96	19.82	13.72	7.62	1.52	-4.57
690	151	89.94	83.84	77.74	70.12	62.50	56.40	50.30	44.21	36.59	32.01	22.87	16.77	10.67	4.57	-1.52

(Plotted on graphs, x-axis, values to be multiplied by 0.656)

TEST SIDE NO.1, PHALEN MINE
HEIGHT CONVERGENCE MEASUREMENTS

Face # Support	Dev Number	Conver-gence (height) Support 631	Conver-gence (height) Support 635	Conver-gence (height) Support 639	Conver-gence (height) Support 644	Conver-gence (height) Support 649	Conver-gence (height) Support 653	Conver-gence (height) Support 657	Conver-gence (height) Support 661	Conver-gence (height) Support 666	Conver-gence (height) Support 669	Conver-gence (height) Support 675	Conver-gence (height) Support 679	Conver-gence (height) Support 683	Conver-gence (height) Support 687	Conver-gence (height) Support 691
291	59.4	2.385	2.355	2.545	2.345	2.37	2.39	2.43	2.38	2.325	2.46	2.47	2.42	2.47	2.405	2.22
317	60.4	2.39	2.365	2.55	2.35	2.375	2.39	2.44	2.37	2.33	2.47	2.48	2.43	2.48	2.42	2.225
319	64.4															
346	67.4	2.39	2.365	2.55	2.35	2.38	2.39	2.44	2.39	2.325	2.465	2.475	2.425	2.48	2.415	2.235
360	72.4															
388	78.3															
394	79.3															
401	80.4															
452	92.4	2.4	2.37	2.55	2.35	2.385	2.4	2.41	2.39	2.33	2.47	2.48	2.43	2.475	2.41	2.23
466	94.5	2.39	2.365	2.55	2.35	2.375	2.39	2.41	2.385	2.325	2.465	2.475	2.425	2.48	2.42	2.225
490	100.4	2.385	2.36	2.54	2.34	2.37	2.39	2.43	2.385	2.32	2.75	2.47	2.425	2.48	2.41	2.225
503	102.4	2.395	2.365	2.45	2.345	2.37	2.39	2.425	2.38	2.315	2.46	2.475	2.42	2.47	2.41	2.23
530	108.4	2.38	2.355	2.54	2.345	2.365	2.39	2.43	2.375	2.315	2.46	2.47	2.42	2.465	2.405	2.22
536	110.0	2.375	2.355	2.54	2.335	2.365	2.395	2.425	2.375	2.315	2.465	2.47	2.41	2.465	2.405	2.225
544	114.4	2.385	2.365	2.545	2.34	2.37	2.385	2.43	2.375	2.315	2.46	2.47	2.42	2.47	2.41	2.22
555	116.4	2.375	2.355	2.535	2.33	2.365	2.395	2.425	2.375	2.315	2.46	2.47	2.415	2.465	2.41	2.22
567	121.5	2.37	2.355	2.535	2.33	2.365	2.38	2.425	2.375	2.31	2.455	2.47	2.415	2.465	2.405	2.22
575	123.4	2.37	2.35	2.535	2.325	2.365	2.38	2.425	2.37	2.315	2.455	2.47	2.41	2.465	2.405	2.22
593	127.4	2.365	2.35	2.53	2.325	2.36	2.37	2.42	2.37	2.31	2.45	2.47	2.41	2.46	2.4	2.215
606	129.4	2.36	2.345	2.525	2.32	2.355	2.37	2.42	2.365	2.305	2.45	2.47	2.41	2.46	2.4	2.215
611	130.4	2.3575	2.3425	2.5225	2.315			2.415	2.365	2.305	2.4475	2.465	2.41	2.46	2.4	2.215
624	134.4	2.345	2.335	2.515	2.3	2.345	2.365	2.4075	2.3575	2.29	2.44	2.46	2.4075	2.455	2.3975	2.215
630	135.7	2.3225	2.3275	2.5075	2.295	2.345	2.365	2.4075	2.355	2.29	2.44	2.46	2.4075	2.4575	2.3975	2.2125
630	135.7	2.32	2.3275	2.5075	2.295	2.345	2.3625	2.4075	2.355	2.29	2.44	2.46	2.405	2.4575	2.3975	2.2125
630	135.9	2.315	2.325	2.5075	2.295	2.3425	2.3625	2.4075		2.2875	2.44	2.4575	2.4075	2.4575	2.3975	2.2125
630	136.0		2.3225	2.5075	2.2925	2.3425	2.3625	2.4075	2.3555		2.4375	2.44	2.4075	2.4575	2.3975	2.2125
632	136.1		2.3225	2.5075	2.295	2.3425	2.3625	2.4075	2.355	2.29	2.435	2.465	2.4075	2.4575	2.3975	2.2125
632	136.7		2.3225	2.5075	2.2925	2.3425	2.36	2.4025	2.355	2.2875	2.435	2.4575	2.4025	2.4575		2.21
632	136.9		2.3175	2.505	2.29	2.34	2.36	2.405	2.355	2.2875	2.435	2.4575	2.4025	2.455	2.3925	2.21
633	137.1		2.315	2.5025	2.29	2.34	2.36	2.405	2.3525	2.285	2.435	2.4575	2.4025	2.455	2.3925	2.21
634	137.7		2.305	2.505	2.28	2.34	2.355	2.405	2.355	2.28	2.43	2.445	2.4	2.45	2.39	2.21
635	137.8		2.293	2.501	2.29	2.34	2.335	2.4	2.35	2.28	2.434	2.457	2.405	2.45	2.392	2.207
637	138.0			2.49	2.285	2.345	2.335	2.415	2.345	2.28	2.43	2.435	2.4	2.453	2.395	2.206
638	138.1			2.469	2.267	2.34	2.365	2.41	2.347	2.283	2.43	2.455	2.4	2.445	2.385	2.20
642	138.4				2.258	2.335	2.358	2.4	2.34	2.273	2.435	2.455	2.394	2.446	2.386	2.202
642	138.7				2.245	2.3275	2.345	2.385	2.345	2.2775	2.4325	2.4525	2.4	2.45	2.3875	2.2075
644	138.9															
644	138.9					2.32	2.35	2.385	2.345	2.28	2.43	2.4525	2.3975	2.45	2.39	2.2075
644	138.9															
645	142.3					2.31	2.3425	2.4	2.34	2.275	2.4275	2.45	2.395	2.4525	2.39	2.205
648	142.5					2.3	2.3475	2.3975	2.34	2.2725	2.4275	2.45	2.3975	2.45	2.3875	2.2025
649	142.7															
649	142.8					2.275	2.335	2.3825	2.3375	2.27	2.425	2.4475	2.395	2.45	2.3875	2.205
651	142.9						2.33	2.38	2.335	2.2725	2.42	2.45	2.3975	2.4475	2.3875	2.205
651	142.9															
651	143.4						2.32	2.3775	2.3325	2.27	2.4225	2.45	2.395	2.4475	2.385	2.205
651	143.5															
652	143.5						2.32	2.375	2.33	2.27	2.4225	2.45	2.395	2.4475	2.385	2.205
654	143.8							2.375	2.33	2.268	2.42	2.451	2.398	2.447	2.385	2.203
655	143.9							2.368	2.324	2.265	2.425	2.452	2.395	2.446	2.385	2.203
657	144.3								2.308	2.277	2.419	2.448	2.399	2.44	2.389	2.202
657	144.5								2.314	2.266	2.419	2.443	2.401	2.443	2.396	2.202
657	144.5															
657	144.6															
659	144.7															
659	144.7								2.308	2.265	2.37	2.445	2.39	2.445	2.385	2.205
659	144.7															
661	144.8															
661	144.8								2.265	2.25	2.415	2.452	2.398	2.451	2.384	2.205
663	144.8															
663	144.9															
663	144.9									2.245	2.41	2.445	2.39	2.445	2.387	2.2
664	145.4															
664	145.4									2.235	2.4025	2.4425	2.3875	2.4425	2.38	2.195
665	145.5									2.2275	2.4	2.44	2.3875	2.44	2.3775	2.1975
666	145.8										2.395	2.441	2.386	2.443	2.386	2.2
666	145.8															
667	145.8															
667	145.8															
667	145.9										2.38	2.438	2.392	2.441	2.382	2.19
669	147.0											2.43	2.385	2.4375	2.375	2.1925
670	148.1											2.42	2.375	2.4325	2.375	2.1929
672	148.2											2.42	2.375	2.4325	2.375	2.1925
674	148.4											2.41	2.372	2.433	2.382	2.191
676	148.4												2.368	2.434	2.375	2.194
676	148.6												2.368	2.434	2.375	2.195
676	149.0												2.364	2.426	2.368	2.192
676	149.1												2.365	2.425	2.37	2.19
678	149.3													2.423	2.374	2.187
681	149.5													2.424	2.374	2.187
682	150.0													2.408	2.385	2.18
682	150.1															
684	150.1															
684	150.1															
684	150.1														2.354	2.18
687	150.4														2.35	2.154
688	150.5															2.122
688	150.5															2.112
688	150.6															2.098
690	151.0															2.091

(Raw datas)

TEST SIDE NO.1, PHALEN MINE
HEIGHT CONVERGENCE (mm)

Face @ Support	Day Number	Support 631	Support 635	Support 639	Support 644	Support 649	Support 653	Support 657	Support 661	Support 665	Support 669	Support 673	Support 679	Support 683	Support 687	Support 691
291	19.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
317	60.4	5	10	5	5	5	0	10	10	5	10	10	10	10	15	5
319	64.4															
346	67.4	5	10	5	5	10	0	10	10	0	5	5	5	10	10	10
360	72.4															
380	78.3															
394	79.3															
401	80.4															
452	92.4	15	15	5	5	15	10	-30	10	5	10	10	10	5	5	10
466	94.5	5	10	5	5	5	0	-20	5	0	5	5	5	10	15	5
490	100.4	0	5	-5	-5	0	0	0	5	-5	290	0	5	10	5	5
503	102.4	10	10	-75	0	0	0	-5	0	-10	0	5	0	0	5	10
530	108.4	-5	0	-5	0	-5	0	0	-5	-10	0	0	0	-5	0	0
536	110.0	-10	0	-5	-10	-5	5	-5	-5	-10	5	0	-10	-5	0	5
544	114.4	0	10	0	-5	0	-5	0	-5	-10	0	0	0	0	5	0
555	116.4	-10	0	-10	-15	-5	5	-5	-5	-10	0	0	-5	-5	5	0
567	121.5	-15	0	-10	-15	-5	-10	-5	-5	-15	-5	0	-5	-5	0	[illegible]
575	123.4	-15	-5	-10	-20	-5	-10	-5	-10	-10	-5	0	-10	-5	0	0
593	127.4	-20	-5	-15	-20	-10	-20	-10	-10	-15	-10	0	-10	-10	-5	-5
606	129.4	-25	-10	-20	-25	-15	-20	-10	-15	-20	-10	0	-10	-10	-5	-5
611	130.4	-27.5	-12.5	-22.5	-30			-15	-15	-20	-12.5	-5	-10	-10	-5	-5
624	134.4	-40	-20	-30	-45	-25	-25	-22.5	-22.5	-35	-20	-10	-12.5	-15	-7.5	-5
630	135.7	-42.5	-27.5	-37.5	-50	-25	-25	-22.5	-25	-35	-20	-10	-12.5	-12.5	-7.5	-7.5
630	135.7	-65	-27.5	-37.5	-50	-25	-27.5	-22.5	-25	-35	-30	-10	-15	-12.5	-7.5	-7.5
630	135.9	-70	-30	-37.5	-50	-27.5	-27.5	-22.5		-37.5	-20	-12.5	-12.5	-12.5	-7.5	-7.5
630	136.0		-32.5	-37.5	-52.5	-27.5	-27.5	-22.5	-24.5		-22.5	-10	-12.5	-12.5	-7.5	-7.5
632	136.1		-32.5	-37.5	-50	-27.5	-27.5	-22.5	-25	-35	-25	-5	-12.5	-12.5	-7.5	-7.5
632	136.7		-32.5	-37.5	-52.5	-27.5	-30	-27.5	-25	-37.5	-25	-12.5	-17.5	-12.5		-10
632	136.9		-37.5	-40	-55	-30	-30	-25	-25	-37.5	-25	-12.5	-17.5	-15	-12.5	-10
633	137.1		-40	-42.5	-55	-30	-30	-25	-27.5	-40	-25	-12.5	-17.5	-15	-12.5	-10
634	137.7		-50	-40	-65	-30	-35	-25	-25	-45	-30	-25	-20	-20	-15	-10
635	137.8		-62	-44	-55	-30	-55	-30	-30	-45	-26	-13	-15	-20	-13	-13
637	138.0			-55	-60	-25	-35	-15	-35	-45	-30	-35	-20	-17	-10	-15
638	138.1			-76	-78	-30	-25	-20	-33	-42	-30	-15	-20	-25	-20	-12
642	138.4				-87	-35	-32	-30	-40	-52	-25	-15	-26	-24	-19	-18
642	138.7				-100	-42.5	-45	-45	-35	-47.5	-27.5	-17.5	-20	-20	-17.5	-12.5
644	138.9															
644	138.9					-50	-40	-45	-35	-45	-30	-17.5	-22.5	-20	-15	-12.5
644	138.9															
645	142.3					-40	-47.5	-30	-40	-50	-32.5	-20	-25	-17.5	-15	-15
648	142.5					-70	-42.5	-32.5	-40	-52.5	-32.5	-20	-22.5	-20	-17.5	-17.5
649	142.7															
649	142.8					-85	-55	-47.5	-42.5	-55	-35	-22.5	-25	-20	-17.5	-15
651	142.9						-60	-50	-45	-52.5	-40	-20	-22.5	-22.5	-17.5	-15
651	142.9															
651	143.4						-70	-52.5	-47.5	-55	-37.5	-20	-25	-22.5	-20	-15
651	143.5															
652	143.5						-70	-55	-50	-55	-37.5	-20	-25	-22.5	-20	-15
654	143.8							-55	-50	-57	-60	-19	-22	-23	-20	-17
656	143.9							-62	-56	-60	-73	-18	-25	-24	-20	-17
657	144.3															
657	144.5								-72	-48	-41	-22	-21	-30	-16	-17
657	144.5								-60	-59	-41	-27	-19	-27	-9	-18
657	144.6															
659	144.7															
659	144.7															
659	144.7								-75	-60	-90	-25	-30	-25	-20	-15
661	144.8															
661	144.8															
663	144.8								-115	-75	-85	-18	-22	-19	-21	-15
663	144.9															
663	144.9															
664	145.4									-80	-50	-25	-30	-25	-18	-20
664	145.4															
665	145.5									-90	-57.5	-27.5	-32.5	-27.5	-25	-25
666	145.8									-97.5	-60	-30	-32.5	-30	-27.5	-22.5
666	145.8										-65	-29	-34	-27	-19	-20
667	145.8															
667	145.8															
667	145.9															
669	147.0										-80	-32	-28	-29	-23	-30
670	148.1											-40	-35	-32.5	-30	-27.5
672	148.2											-50	-45	-37.5	-38	-27.1
674	148.4											-56	-45	-37.5	-30	-27.5
676	148.4											-60	-48	-37	-33	-29
676	148.6												-52	-36	-30	-26
676	149.0												-52	-36	-38	-25
676	149.1												-56	-44	-37	-28
678	149.3												-58	-45	-35	-30
681	149.5													-47	-31	-33
682	150.0													-46	-31	-33
682	150.1													-62	-50	-46
684	150.1															
684	150.1															
684	150.1															
687	150.4														-51	-40
688	150.5														-55	-46
688	150.5															-45
688	150.6															-100
690	151.0															-122
																-129

(Converted datas,

as plotted on graphs, y-axis)

TEST SITE NO.1, PHALEN MINE
WIDTH CONVERGENCE MEASUREMENTS

Face @ Support	Day Number	Conver-gence (width) Support 631	Conver-gence (width) Support 635	Conver-gence (width) Support 639	Conver-gence (width) Support 644	Conver-gence (width) Support 649	Conver-gence (width) Support 653	Conver-gence (width) Support 657	Conver-gence (width) Support 661	Conver-gence (width) Support 666	Conver-gence (width) Support 669	Conver-gence (width) Support 675	Conver-gence (width) Support 679	Conver-gence (width) Support 683	Conver-gence (width) Support 687	Conver-gence (width) Support 691
360	72.4	4,725	4,735	4.805	4,795	4.685	4,705	4,755	4,740	4,750	4.835	4,750	4,790	4,750	4,755	4,790
388	78.3															
394	79.3															
401	80.4															
452	92.4	4,730	4,735	4.815	4,795	4.675	4,700	4,760	4,740	4,750	4,795	4,745	4,785	4,725	4,745	4,760
466	94.5	4,730	4,730	4.805	4,795	4.675	4,700	4,755	4,745	4,750	4,785	4,760	4,790	4,745	4,760	4,790
490	100.4	4,725	4,730	4.810	4.815	4,700	4,720	4,770	4,750	4,750	4.820	4,755	4,785	4,730	4,750	4,770
503	102.4	4,725	4,730	4.805	4,795	4.675	4.695	4,755	4,735	4,750	4.815	4,745	4,785	4,740	4,745	4,785
530	108.4	4,725	4,730	4.805	4,795	4.675	4.695	4,760	4,740	4,745	4.820	4,745	4,785	4,745	4,750	4,765
536	110.0	4,725	4,730	4.800	4,795	4.675	4,700	4,750	4,735	4,745	4.820	4,745	4,785	4,725	4,750	4,780
544	114.4	4,720	4,725	4,795	4,790	4.670	4.695	4,750	4,735	4,745	4.815	4,745	4,795	4,745	4,755	4,785
555	116.4	4,720	4,730	4.805	4,795	4.625	4,700	4,755	4,735	4,745	4.820	4,745	4,790	4,725	4,745	4,765
567	121.5	4,725	4,730	4.805	4,795	4.675	4.695	4,755	4,740	4,740	4.820	4,745	4,790	4,725	4,745	4,765
575	123.4	4,725	4,730	4.800	4,795	4.675	4,700	4,755	4,735	4,735	4.820	4,745	4,790	4,725	4,745	4,765
593	127.4	4,725	4,730	4.800	4,795	4.675	4.695	4,750	4,735	4,740	4.820	4,745	4,785	4,725	4,745	4,765
606	129.4	4,740	4,730	4.800	4,795	4.675	4,700	4,750	4,735	4,735	4.820	4,745	4,785	4,725	4,750	4,765
611	130.4	4,725	4,730	4.800	4,790	4.675	4,715	4,755	4,735	4,735	4.820	4,745	4,785	4,725	4,745	4,765
624	134.4	4,720	4,725	4.800	4,790	4.675	4,700	4,750	4,785	4,740	4.820	4,745	4,785	4,730	4,750	4,765
630	135.7	4,725	4,720	4.800	4,795	4.670	4.695	4,750	4,765	4,740	4.815	4,740	4,785	4,725	4,745	4,765
630	135.7	4,720	4,725	4.800	4,795	4.670	4.695	4,750	4,780	4,740	4.815	4,740	4,785	4,725	4,745	4,765
630	135.9	4,720	4,725	4,795	4,795	4.670	4.695	4,745		4,740	4.815	4,745	4,785	4,725	4,745	4,765
630	136.0		4,725	4.800	4,790	4.670	4.695	4,750	4,735	4,775	4.815	4,740	4,785	4,725	4,745	4,765
632	136.1		4,725	4.800	4,790	4.670	4.695	4,750	4,735	4,740	4.815	4,740	4,785	4,725	4,745	4,765
632	136.7		4,725	4,795	4,790	4.675	4.695	4,750	4,735	4,740	4.815	4,740	4,785	4,725	4,740	4,765
632	136.9		4,725	4.800	4,790	4.670	4.695	4,750	4,735	4,740	4.815	4,740	4,785	4,725	4,740	4,765
633	137.1		4,725	4.800	4,790	4.675	4.695	4,750	4,735	4,740	4.815	4,745	4,785	4,725	4,745	4,765
634	137.7		4,725	4.800	4,790	4.685	4.695	4,750	4,735	4,740	4.815	4,740	4,785	4,725	4,745	4,765
635	137.8		4,725	4.800	4,790	4.690	4.695	4,750	4,730	4,740	4.815	4,745	4,790	4,725	4,745	4,765
637	138.0			4.805	4,790	4.690	4.695	4,745	4,735	4,740	4.815	4,745	4,785	4,725	4,745	4,765
638	138.1			4.805	4,790	4.675	4.695	4,755	4,735	4,740	4.815	4,745	4,785	4,725	4,745	4,765
642	138.4				4,790	4.675	4.695	4,745	4,735	4,740	4.815	4,740	4,785	4,725	4,745	4,765
642	138.7				4,785	4.670	4,700	4,750	4,735	4,740	4.815	4,745	4,785	4,725	4,745	4,765
644	138.9															
644	138.9				4,790	4.675	4.695	4,750	4,730	4,740	4.815	4,740	4,785	4,725	4,745	4,765
644	138.9															
645	142.3					4.675	4.695	4,750	4,730	4,740	4.815	4,743	4,785	4,725	4,745	4,765
648	142.5					4.675	4,700	4,750	4,733	4,740	4.818	4,745	4,788	4,725	4,748	4,770
649	142.7															
649	142.8					4.670	4.695	4,750	4,730	4,740	4.815	4,740	4,785	4,725	4,745	4,765
651	142.9						4.695	4,750	4,730	4,740	4.815	4,740	4,785	4,725	4,745	4,765
651	142.9															
651	143.4						4.695	4,745	4,730	4,740	4.810	4,740	4,785	4,725	4,745	4,765
651	143.5															
652	143.5						4.695	4,745	4,730	4,740	4.815	4,740	4,785	4,725	4,745	4,765
654	143.8							4,745	4,730	4,740	4.815	4,740	4,785	4,725	4,745	4,765
655	143.9							4,745	4,735	4,740	4.815	4,745	4,785	4,725	4,745	4,765
657	144.3							4,745	4,731	4,741	4.817	4,745	4,785	4,728	4,749	4,768
657	144.5								4,733	4,740	4.819	4,745	4,788	4,732	4,746	4,768
657	144.5															
657	144.6															
659	144.7															
659	144.7								4,730	4,746	4.815	4,743	4,790	4,725	4,745	4,765
659	144.7															
661	144.8															
661	144.8								4,724	4,738	4.815	4,743	4,787	4,726	4,745	4,767
663	144.8															
663	144.9															
663	144.9									4,739	4.815	4,744	4,787	4,725	4,744	4,766
664	145.4															
664	145.4									4,735	4.815	4,745	4,785	4,725	4,745	4,765
665	145.5									4,735	4.815	4,745	4,785	4,725	4,745	4,765
666	145.8										4.815	4,742	4,786	4,725	4,745	4,765
666	145.8															
667	145.8															
667	145.8															
667	145.9										4.810	4,744	4,790	4,728	4,746	4,768
669	147.0											4,745	4,790	4,725	4,745	4,765
670	148.1											4,745	4,790	4,725	4,745	4,765
672	148.2											4,745	4,790	4,725	4,745	4,765
674	148.4											4,744	4,790	4,726	4,745	4,765
676	148.4												4,790	4,727	4,745	4,766
676	148.6												4,790	4,725	4,745	4,765
676	149.0												4,790	4,725	4,745	4,765
676	149.1												4,790	4,725	4,745	4,765
678	149.3													4,725	4,745	4,765
681	149.5													4,725	4,745	4,765
682	150.0													4,723	4,745	4,763
682	150.1															
684	150.1															
684	150.1															
684	150.1													4,723	4,745	4,763
687	150.4														4,785	4,763
688	150.5															4,763
688	150.5															4,763
688	150.6															4,766
690	151.0															4,755

(Raw datas)

TEST SITE NO.1, PHALEN MINE
Width convergence (mm)

Face # Support	Day Number	Support 631	Support 635	Support 639	Support 644	Support 649	Support 653	Support 657	Support 661	Support 665	Support 669	Support 673	Support 679	Support 682	Support 687	Support 691
360	72.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	78.3															
394	79.3															
401	80.4															
452	92.4	5	0	10	0	-10	-5	5	0	0	-40	-5	-5	-25	-10	-10
466	94.5	5	-5	0	0	-10	-5	0	5	0	-50	10	0	-5	5	0
490	100.4	0	-5	5	20	15	15	15	10	0	-15	5	-5	-20	-5	-10
503	102.4	0	-5	0	0	-10	-10	0	-5	0	-20	-5	-5	-10	-10	-5
530	108.4	0	-5	0	0	-10	-10	5	0	-5	-15	-5	-5	-5	-5	-15
536	110.0	0	-5	-5	0	-10	-5	-5	-5	-5	-15	-5	-5	-25	-5	-10
544	114.4	-5	-10	-10	-5	-15	-10	-5	-5	-5	-20	-5	5	-5	0	-10
555	116.4	-5	-5	0	0	-10	-5	0	-5	-5	-15	-5	0	-25	-10	-25
567	121.5	0	-5	0	0	-10	-10	0	0	-10	-15	-5	0	-25	-10	-25
575	123.4	0	-5	-5	0	-10	-5	0	-5	-15	-15	-5	0	-25	-10	-25
593	127.4	0	-5	-5	0	-10	-10	-5	-5	-10	-15	-5	-5	-25	-10	-25
606	129.4	15	-5	-5	0	-10	-5	-5	-5	-15	-15	-5	-5	-25	-5	-25
611	130.4	0	-5	-5	-5	-10	10	0	-5	-15	-15	-5	-5	-25	-10	-25
624	134.4	-5	-10	-5	-5	-10	-5	-5	45	-10	-15	-5	-5	-20	-5	-25
630	135.7	0	-5	-5	0	-15	-10	-5	25	-10	-20	-10	-5	-25	-10	-25
630	135.7	-5	-10	-5	0	-15	-10	-5	40	-10	-20	-10	-5	-25	-10	-25
630	135.9	-5	-10	-10	0	-15	-10	-10		-10	-20	-5	-5	-25	-10	-25
630	136.0		-10	-5	-5	-15	-10	-5	-5	25	-20	-10	-5	-25	-10	-25
632	136.1		-10	-5	-5	-15	-10	-5	-5	-10	-20	-10	-5	-25	-10	-25
632	136.7		-10	-10	-5	-10	-10	-5	-5	-10	-20	-10	-5	-25	-15	-25
632	136.9		-10	-5	-5	-15	-10	-5	-5	-10	-20	-10	-5	-25	-15	-25
633	137.1		-10	-5	-5	-10	-10	-5	-5	-10	-20	-5	-5	-25	-10	-25
634	137.7		-10	-5	-5	0	-10	-5	-5	-10	-20	-10	-5	-25	-10	-25
635	137.8		-10	-5	-5	5	-10	-5	-10	-10	-20	-5	0	-25	-10	-25
637	138.0			0	-5	5	-10	-10	-5	-10	-20	-5	-5	-25	-10	-25
638	138.1			0	-5	-10	-10	0	-5	-10	-20	-5	-5	-25	-10	-25
642	138.4				-5	-10	-10	-10	-5	-10	-20	-10	-5	-25	-10	-25
642	138.7				-10	-15	-5	-5	-5	-10	-20	-5	-5	-25	-10	-25
644	138.9															
644	138.9				-5	-10	-10	-5	-10	-10	-20	-10	-5	-25	-10	-25
644	138.9															
645	142.3					-10	-10	-5	-10	-10	-20	-8	-5	-25	-10	-25
648	142.5					-10	-5	-5	-6	-10	-18	-5	-3	-25	-8	-26
649	142.7															
649	142.8					-15	-10	-5	-10	-10	-20	-10	-5	-25	-10	-25
651	142.9						-10	-5	-10	-10	-20	-10	-5	-25	-10	-25
651	142.9															
651	143.4						-10	-10	-10	-10	-25	-10	-5	-25	-10	-25
651	143.5															
652	143.5						-10	-10	-10	-10	-20	-10	-5	-25	-10	-15
654	143.8							-10	-10	-10	-20	-10	-5	-25	-10	-25
655	143.9							-10	-5	-10	-20	-5	-5	-25	-10	-25
657	144.3							-10	-4	-4	-18	-5	-5	-22	-4	-22
657	144.5								-7	-10	-16	-5	-2	-18	-4	-22
657	144.5															
657	144.6															
659	144.7															
659	144.7								-10	-10	-20	-8	0	-25	-10	-25
659	144.7															
661	144.8															
661	144.8								-16	-12	-20	-7	-3	-24	-10	-22
663	144.8															
663	144.9															
663	144.9									-11	-20	-4	-3	-25	-11	-24
664	145.4															
664	145.4									-15	-20	-5	-5	-25	-10	-25
665	145.5									-15	-20	-5	-5	-22	-10	-25
666	145.8										-20	-8	-4	-25	-10	-25
666	145.8															
667	145.8															
667	145.8															
667	145.9											-4	0	-22	-4	-22
669	147.0											-5	0	-25	-10	-25
670	148.1											-5	0	-25	-10	-25
672	148.2											-5	0	-25	-10	-25
674	148.4											-4	0	-24	-10	-25
676	148.4												0	-23	-10	-24
676	148.6												0	-25	-10	-25
676	149.0												0	-25	-10	-25
676	149.1												0	-25	-10	-25
678	149.3													-25	-10	-25
681	149.5													-25	-10	-25
682	150.0													-27	-10	-27
682	150.1															
684	150.1															
684	150.1															
684	150.1													-27	-10	-27
687	150.4														30	-27
688	150.5															-27
688	150.5															-27
688	150.6															-30
690	151.0															-35

(Converted datas,

as plotted on graphs, y-axis)

TEST SITE NO.1, PHALEN MINE
LOW SIDE STEEL SETS

Face @ Support	Day Number	Mech. Strain Gage Web 631	Mech. Strain Gage Flange 631	Mech. Strain Gage Web 635	Mech. Strain Gage Flange 635	Mech. Strain Gage Web 639	Mech. Strain Gage Flange 639	Mech. Strain Gage Web 644	Mech. Strain Gage Flange 644	Mech. Strain Gage Web 649	Mech. Strain Gage Flange 649	Mech. Strain Gage Web 653	Mech. Strain Gage Flange 653	Mech. Strain Gage Web 657	Mech. Strain Gage Flange 657	Mech. Strain Gage Web 661	Mech. Strain Gage Flange 661	Mech. Strain Gage Web 666	Mech. Strain Gage Flange 666	Mech. Strain Gage Web 669	Mech. Strain Gage Flange 669	Mech. Strain Gage Web 675	Mech. Strain Gage Flange 675	Mech. Strain Gage Web 679	Mech. Strain Gage Flange 679	Mech. Strain Gage Web 683	Mech. Strain Gage Flange 683	Mech. Strain Gage Web 687	Mech. Strain Gage Flange 687	Mech. Strain Gage Web 691	Mech. Strain Gage Flange 691	Calibration	Temp. (celsius)
544	114																																
555	116																															1273	11
567	121	1293	1730	1610	1561	2115	1583	1739	1544	1494	1703	1418	1435	1754	1282	1464	955	1419	1698	1390	1664	1201	1725	1241	1634	1774	2086	2130	1436	1737	1557	1268	10.8
575	123	1291	1730	1607	1558	2114	1580	1737	1544	1491	1701	1417	1433	1753	1282	1464	955	1420	1694	1389	1659	1201	1726	1242	1635	1777	2086	2133	1438	1741	1558	1240	11
593	127	1294	1729	1610	1562	2114	1581	1736	1545	1493	1702	1419	1444	1753	1282	1466	957	1420	1694	1390	1661	1203	1726	[illegible]	1637	1779	2089	2135	1439	1744	1560	1241	12
606	129	1291	1728	1607	1559	2112	1578	1735	1541	1494	1701	1416	1446	1752	1283	1465	959	1419	1692	1391	1660	1201	[illegible]	1244	1634	1777	2090	2136	1440	1743	1561	1243	11
611	130	1288	1726	1602	1556	2111	1574	1731	1541	1488	1699	1414	1430	1749	1278	1461	956	1416	1690	1387	1655	1199	1722	1236	1631	1771	2086	2131	1436	1739	1557	1245	11.5
624	134	1288	1720	1603	1559	2110	1572	1731	1540	1490	1696	1413	1427	1747	1278	1460	954	1415	1690	1387	1656	1198	1719	1238	1630	1773	2087	2130	1435	1738	1556	1239	12
630	135.7																															1240	12
630	135.7																																
630	135.9																																
630	136																																
632	136.1																																
632	136.7																																
632	136.9																																
633	137.1																																
634	137.7																																
635	137.8																																
637	138																																
638	138.1																																
642	138.4																																
642	138.7							1832	1602	1641	1800	1579	1584	1037	1469	1615	1212	1576	1789	1353	1762	1804	1819	1434	1746	1850	112	152	1602	1039	1697	1442	12
644	138.9																																
644	138.9									1481	1641	1419	1430	1605	1309	1460	56	1419	1634	1398	1606	1280	1664	1375	1609	1607	1959	1005	1433	1669	1521	1380	12
644	138.9																																
645	142.3									1409	1650	1424	1432	1692	1316	1470	104	1430	1646	1401	1615	1252	1671	1389	1603	1718	1972	1001	1451	1679	1535	1388	11
648	142.5									1507	1663	1450	1453	1607	1343	1490	85	1444	1665	1432	1636	1277	1675	1393	1612	1724	1976	1002	1452	1609	1541	1396	11.3
649	142.7																																
649	142.8											1436	1448	1703	1328	1479	78	1440	1651	1414	1625	1260	1682	1390	1605	1721	1976	1002	1454	1694	1549	1397	11.0
651	142.9											1433	1447	1699	1323	1471	73	1437	1648	1412	1622	1262	1679	1394	1603	1721	1973	1005	1450	1691	1545	1394	11.5
651	142.9																																
651	143.4											1705	1797	1076	1684	1028	1451	1787	1025	1765	1000	1629	1053	1654	1960	96	353	375	1092	65	1894	1652	11.5
651	143.5																																
652	143.5											1705	1798	1074	1687	1027	1449	1787	1025	1766	1000	1629	1054	1654	1960	95	351	378	1084	65	1901	1650	11.5
654	143.8													1074	1683	1027	1451	1790	1027	1769	999	1630	1053	1657	1970	93	351	375	1080	64	1901	1658	11.9
655	143.9													1075	1685	1024	1447	1788	1024	1763	998	1624	1055	1655	1973	95	351	376	1083	63	1901	1657	12
657	144.3													1071	1684	1025	1477	1788	1021	1770	995	1639	1052	1679	1973	104	353	374	1084	61	1988	1660	11.5

(Raw datas)

TEST SITE NO.1, PHALEN MINE
LOW SIDE STEEL SETS

Face # Support	Bar Number	Mech. Strain Gage Web 631	Mech. Strain Gage Flange 631	Mech. Strain Gage Web 635	Mech. Strain Gage Flange 635	Mech. Strain Gage Web 639	Mech. Strain Gage Flange 639	Mech. Strain Gage Web 644	Mech. Strain Gage Flange 644	Mech. Strain Gage Web 649	Mech. Strain Gage Flange 649	Mech. Strain Gage Web 653	Mech. Strain Gage Flange 653	Mech. Strain Gage Web 657	Mech. Strain Gage Flange 657	Mech. Strain Gage Web 661	Mech. Strain Gage Flange 661	Mech. Strain Gage Web 666	Mech. Strain Gage Flange 666	Mech. Strain Gage Web 669	Mech. Strain Gage Flange 669	Mech. Strain Gage Web 675	Mech. Strain Gage Flange 675	Mech. Strain Gage Web 679	Mech. Strain Gage Flange 679	Mech. Strain Gage Web 683	Mech. Strain Gage Flange 683	Mech. Strain Gage Web 687	Mech. Strain Gage Flange 687	Mech. Strain Gage Web 691	Mech. Strain Gage Flange 691	Calibration	Temp. (celsius)
657	144.5																																
657	144.5																																
657	144.5													1075	1685	1825	1471	1793	1025	1771	1003	1643	1053	1663	1974	90	351	379	1804	68	2002	1667	12
657	144.5																																
657	144.6																																
659	144.7																																
659	144.7															1823	1446	1784	1016	1764	1005	1620	1054	1656	1968	102	354	376	1804	63	1991	1657	11.5
659	144.7																																
661	144.8																																
661	144.8															1824	1455	1783	1022	1760	993	1622	1046	1656	1965	96	346	375	1796	65	1090	1655	11.5
663	144.8																																
663	144.9																																
663	144.9															1831	1473	1794	1026	1771	1980	1629	1055	1656	1983	1000	356	380	1706	1073	1984	1656	11.5
664	145.4																																
660	145.4																	1787	1019	1764	1996	1626	1049	1651	1965	1091	349	373	1700	1062	1986	1656	11.5
665	145.5																	1795	1026	1757	1999	1620	1054	1655	1970	1096	335	377	1702	1064	1903	1657	11.5
666	145.8																	1793	1025	1771	1998	1635	1058	1662	1981	1098	337	382	1706	1068	1900	1655	11.5
666	145.8																																
667	145.8																																
667	145.8																																
667	145.9																			1778	1904	1639	1063	1670	1994	1009	369	386	1714	1074	1908	1659	11.5
669	147																					1634	1058	1664	1978	104	368	387	1807	1075	1909	1666	11.5
670	148.1																					1636	1059	1666	1980	106	368	385	1809	1074	1905	1665	11.5
672	148.2																					1636	1058	1663	1979	104	368	385	1810	1074	1902	1665	11.3
674	148.4																					1633	1059	1660	1976	103	367	379	1805	1073	1905	1663	11.5
676	148.4																					1636	1090	1661	1974	99	369	380	1805	1069	1905	1663	11.8
676	148.6																							1635	1974	100	370	385	1804	1069	1904	1665	11.8
676	149																							1661	1965	102	374	381	1802	1066	1901	1666	12.7
676	149.1																							1650	1970	102	371	379	1800	1068	1908	1664	12.5
678	149.3																									100	376	376	1806	1068	1906	1665	13
681	149.5																									100	376	374	1804	1068	1907	1664	13
682	150																									95	383	375	1790	1061	1901	1670	13
682	150.1																																
684	150.1																																
684	150.1																																
684	150.1																									95	374	373	1800	1074	1903	1668	
687	150.4																											375	1825	1074	1905	1669	13
688	150.5																													1077	1905	1670	13.3
688	150.5																													1076	1906	1668	13.5
688	150.6																													1074	1903	1671	14
690	151																													1079	1915	1674	13

(Raw datas)

TEST SITE NO.1, PHALEN MINE
HIGH SIDE STEEL SETS

Face @ Support	Bar Number	Mech. Strain gage Web 631	Mech. Strain gage Flange 631	Mech. Strain gage Web 635	Mech. Strain gage Flange 635	Mech. Strain gage Web 639	Mech. Strain gage Flange 639	Mech. Strain gage Web 644	Mech. Strain gage Flange 644	Mech. Strain gage Web 649	Mech. Strain gage Flange 649	Mech. Strain gage Web 653	Mech. Strain gage Flange 653	Mech. Strain gage Web 657	Mech. Strain gage Flange 657	Mech. Strain gage Web 661	Mech. Strain gage Flange 661	Mech. Strain gage Web 666	Mech. Strain gage Flange 666	Mech. Strain gage Web 669	Mech. Strain gage Flange 669	Mech. Strain gage Web 675	Mech. Strain gage Flange 675	Mech. Strain gage Web 679	Mech. Strain gage Flange 679	Mech. Strain gage Web 683	Mech. Strain gage Flange 683	Mech. Strain gage Web 687	Mech. Strain gage Flange 687	Mech. Strain gage Web 691	Mech. Strain gage Flange 691	Calibration	Temperature (celsius)
657	144.5																																
657	144.5																																
657	144.5													1905	1785	40	1083	1706	1650	56	372	1854	1035	1615	1560	1030	1045	1020	1905	1675	1880	1667	12
657	144.5																																
657	144.6																																
659	144.7																																
659	144.7															43	1083	1699	1643	49	370	1840	1031	1594	1551	1034	1041	1038	1902	1079	1874	1657	11.5
659	144.7																																
661	144.8																																
661	144.8																	1706	1640	154	370	1844	1033	1595	1555	1034	1045	1045	1904	1073	1874	1655	11.5
663	144.8																																
663	144.9																																
663	144.9																	1706	1846	155	375	1846	1037	1597	1555	1036	1045	1042	1903	1073	1886	1656	11.5
664	145.4																																
664	145.4																	1709	1842	155	371	1843	1035	1595	1549	1034	1042	1039	1904	1071	1873	1656	11.5
665	145.5																	1706	1844	157	370	1847	1035	1600	1553	1036	1047	1044	1904	1075	1875	1657	11.5
666	145.8																			161	384	1846	1030	1696	1550	1036	1049	1044	1904	1074	1872	1655	11.5
666	145.8																																
667	145.8																																
667	145.8																																
667	145.9																					1852	1041	1603	1559	1045	1055	1040	1903	1076	1880	1659	11.5
669	147																					1846	1034	1602	1554	1039	1048	1044	1907	1075	1876	1666	11.5
670	148.1																					1845	1034	1601	1554	1037	1049	1045	1905	1075	1877	1665	11.5
672	148.2																					1844	1035	1602	1555	1038	1047	1046	1905	1075	1877	1665	11.5
674	148.4																					1851	1062	1602	1545	1038	1051	1044	1905	1076	1876	1663	11.5
676	148.4																							1603	1545	1033	1047	1040	1902	1070	1872	1663	11.8
676	148.6																							1604	1545	1034	1046	1041	1902	1070	1873	1665	11.8
676	149																							1609	1555	1035	1046	1046	1900	1072	1875	1666	12.7
676	149.1																							1600	1557	1038	1047	1046	1904	1076	1878	1664	12.5
678	149.3																									1644	1550	1049	1914	1078	1879	1665	13
680	149.5																									1645	1549	1048	1916	1079	1879	1664	13
682	150																									1033	1050	1056	1920	1086	1886	1670	13
682	150.1																																
684	150.1																																
684	150.1																																
684	150.1																									1034	1050	1054	1917	1080	1875	1668	
687	150.4																											1057	1920	1075	1871	1669	13
688	150.5																													1074	1854	1670	13.5
688	150.5																													1075	1855	1668	13.5
688	150.6																													1073	1857	1671	14
690	151																													1074	1860	1674	13

(Raw datas)

TEST SITE NO.1, PHALEN MINE
HIGH SIDE STEEL SETS

Face @ Support	Day Number	Mech. Strain gage Web 631	Mech. Strain gage Flange 631	Mech. Strain gage Web 635	Mech. Strain gage Flange 635	Mech. Strain gage Web 639	Mech. Strain gage Flange 639	Mech. Strain gage Web 644	Mech. Strain gage Flange 644	Mech. Strain gage Web 649	Mech. Strain gage Flange 649	Mech. Strain gage Web 653	Mech. Strain gage Flange 653	Mech. Strain gage Web 657	Mech. Strain gage Flange 657	Mech. Strain gage Web 661	Mech. Strain gage Flange 661	Mech. Strain gage Web 666	Mech. Strain gage Flange 666	Mech. Strain gage Web 669	Mech. Strain gage Flange 669	Mech. Strain gage Web 675	Mech. Strain gage Flange 675	Mech. Strain gage Web 679	Mech. Strain gage Flange 679	Mech. Strain gage Web 683	Mech. Strain gage Flange 683	Mech. Strain gage Web 687	Mech. Strain gage Flange 687	Mech. Strain gage Web 691	Mech. Strain gage Flange 691	Calibration	Temperature (celsius)
584	114																															1273	11
555	116																															1268	10.8
567	121	1155	1972	1454	1505	1472	1308	1854	2325	1462	1238	1213	1759	1676	1400	1834	1536	1433	1285	1856	2134	1400	1707	1162	1111	1703	1495	1710	1535	1760	1546	1240	11
575	123	1148	1969	1453	1504	1469	1302	1851	2321	1460	1237	1212	1759	1649	1400	1834	1538	1432	1285	1855	2133	1482	1704	1164	1110	1703	1495	1709	1554	1767	1546	1241	12
595	127	1156	1967	1453	1499	1471	1309	1849	2318	1459	1238	1213	1756	1660	1404	1833	1537	1432	1281	1855	2127	1480	1703	1160	1108	1701	1491	1705	1552	1766	1595	1243	11
606	129	1150	1971	1451	1499	1469	1311	1847	2318	1457	1238	1212	1755	1666	1403	1832	1534	1433	1282	1850	2130	1481	1702	1162	1110	1702	1495	1709	1553	1765	1546	1245	11.5
611	130	1147	1970	1449	1496	1471	1312	1846	2320	1456	1239	1209	1762	1660	1402	1830	1535	1430	1199	1847	2122	1479	1700	1156	1105	1701	1490	1705	1549	1763	1545	1239	12
629	134	0	3136	2689	2736	2715	2559	3098	3527	2710	2584	2465	3012	2913	2660	3070	2792	2696	2584	3040	3354	2730	2952	2412	2356	2935	2745	2959	2812	3017	2885	1240	12
630	135.7																																
630	135.7																																
630	135.9																																
630	136																																
632	136.1																																
632	136.7																																
632	136.9																																
633	137.1																																
634	137.7																																
635	137.8																																
637	138																																
638	138.1																																
642	138.4																																
642	138.7							1920	293	1611	1435	1414	1846	1770	1570	1864	1674	1596	1435	1926	144	1630	1701	1369	1329	1700	1635	1810	1691	1834	1666	1492	12
644	138.9																																
644	138.9									1452	1274	1254	1691	1611	1696	1744	1514	1437	1275	1764	1982	1674	1645	1213	1171	1640	1478	1649	1533	1680	1500	1380	12
644	138.9																																
645	142.3									1462	1280	1273	1699	1630	1427	1730	1531	1455	1289	1779	97	1482	1655	1240	1181	1653	1490	1650	1544	1690	1516	1380	11
648	142.5									1480	1280	1288	1718	1638	1436	1774	1542	1460	1305	1789	1008	1501	1677	1243	1197	1671	1513	1676	1563	1711	1544	1394	11.3
649	142.7																																
649	142.8											1277	1710	1631	1425	1764	1530	1462	1293	1786	1002	1495	1662	1233	1191	1666	1497	1670	1530	1699	1523	1387	11.8
651	142.9											1276	1707	1626	1425	1762	1530	1459	1291	1780	1000	1492	1661	1292	1191	1660	1492	1663	1543	1678	1511	1394	11.5
651	142.9																																
651	143.4											1635	1087	1964	1770	35	1884	1700	1640	57	378	1843	1838	1590	1556	1036	1888	1045	1985	1673	1079	1652	11.5
651	143.5																																
652	143.5											1625	1086	1903	1776	35	1885	1706	1649	56	377	1841	1838	1596	1553	1035	1887	1043	1985	1071	1878	1658	11.5
654	143.8													1904	1780	42	1882	1710	1646	54	375	1845	1836	1599	1554	1040	1885	1045	1981	1074	1876	1658	11.9
655	143.9													1904	1784	40	1885	1709	1647	58	378	1841	1835	1596	1555	1035	1885	1046	1985	1076	1876	1657	12
657	144.3													1901	1786	39	1882	1710	1660	60	373	1845	1842	1600	1569	1035	1884	1044	1903	1075	1879	1660	11.5
657	144.4																																

(Raw datas)

TEST SITE NO.1, PHALEN MINE

LOW SIDE STEEL SETS (Corrected for calibration value and temperature)

Face # Support	Row Number	Mech. Strain gage Web 631	Mech. Strain gage Flange 631	Mech. Strain gage Web 635	Mech. Strain gage Flange 635	Mech. Strain gage Web 639	Mech. Strain gage Flange 639	Mech. Strain gage Web 644	Mech. Strain gage Flange 644	Mech. Strain gage Web 649	Mech. Strain gage Flange 649	Mech. Strain gage Web 653	Mech. Strain gage Flange 653	Mech. Strain gage Web 657	Mech. Strain gage Flange 657	Mech. Strain gage Web 661	Mech. Strain gage Flange 661	Mech. Strain gage Web 666	Mech. Strain gage Flange 666	Mech. Strain gage Web 669	Mech. Strain gage Flange 669	Mech. Strain gage Web 675	Mech. Strain gage Flange 675	Mech. Strain gage Web 679	Mech. Strain gage Flange 679	Mech. Strain gage Web 683	Mech. Strain gage Flange 683	Mech. Strain gage Web 687	Mech. Strain gage Flange 687	Mech. Strain gage Web 691	Mech. Strain gage Flange 691	Calibration	Temp. (celsius)	Difference with calibration	Difference with temperature
652	143.5											1367.0	1380.0	656.0	1269.0	1409.0	1051.0	1369.6	607.0	1348.0	582.0	1211.0	636.0	1236.0	1550.0	-323.0	-67.0	-40.0	1386.0		1482.0	1658	11.5	418	0
654	143.8													655.6	1264.6	1408.6	1052.6	1371.6	608.6	1350.6	580.6	1211.6	634.6	1238.6	1551.6	-325.4	-67.4	-43.4	1381.6		1482.6	1658	11.9	418	0.4
655	143.9													657.5	1267.5	1406.5	1029.5	1370.5	606.5	1345.5	580.5	1206.5	637.5	1237.5	1555.5	-322.6	-66.6	-41.6	1385.5		1485.5	1657	12	417	0.5
657	144.3													651.0	1264.0	1405.0	1057.0	1368.0	601.0	1350.0	575.0	1219.0	632.0	1250.0	1553.0	-316.0	-67.0	-46.0	1380.0			1660	11.5	420	0
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.5																																		
657	144.5																																		
657	144.5																																		
657	144.5																																		
657	144.5																																		
657	144.5													647.5	1257.5	1397.5	1043.5	1365.5	597.5	1343.5	575.5	1215.5	625.5	1235.5	1546.5	-329.6	-76.6	-48.6	1376.5		-427.6	1667	12	427	0.5
657	144.5																																		
657	144.6																																		
659	144.7																																		
659	144.7															1406.0	1029.0	1367.0	599.0	1347.0	580.0	1211.0	637.0	1239.0	1551.0	-315.0	-63.0	-41.0	1387.0		1484.0	1657	11.5	417	0
659	144.7																															1657 s	11.5 s	417	0
661	144.8																																		
661	144.8															1409.0	1040.0	1368.0	607.0	1345.0	570.0	1207.0	621.0	1241.0	1550.0	-319.0	-49.0	-40.0	1381.0		1482.0	1655	11.5	415	0
663	144.8																															1655 s	11.5 s	415	0
663	144.9																															1655 s	11.5 s	415	0
663	144.9															1415.0	1057.0	1378.0	610.0	1355.0		1213.0	639.0	1240.0	1567.0		-60.0	-36.0			1488.0	1656	11.5	416	0
664	145.4																															1656 s	11.5 s	416	0
664	145.4																	1371.6	603.0	1348.0		1210.0	633.0	1235.0	1549.0		-67.0	-43.0			1490.0	1656	11.5	416	0
665	145.5																	1378.0	609.0	1350.0		1211.0	637.0	1238.0	1553.0		-62.0	-40.0			1486.0	1657	11.5	417	0
666	145.8																	1370.0	610.0	1356.0		1220.0	643.0	1247.0	1566.0		-58.0	-33.0			1485.0	1655	11.5	415	0
666	145.8																																		
667	145.8																																		
667	145.8																																		
667	145.9																			1279.0		1220.0	644.0	1251.0	1575.0		-50.0	-33.0			1485.0	1659	11.5	419	0
669	147.0																					1208.0	632.0	1238.0	1552.0	-322.0	-50.0	-39.0	1381.0		1483.0	1666	11.5	426	0
670	148.1																					1211.0	634.0	1241.0	1555.0	-319.0	-57.0	-40.0	1388.0		1480.0	1665	11.5	425	0
672	148.2																					1211.0	633.0	1238.0	1558.0	-321.0	-57.0	-40.0	1385.0		1477.0	1665	11.5	425	0
674	148.4																					1210.0	636.0	1237.0	1553.0	-320.0	-56.0	-44.0	1382.0		1482.0	1663	11.5	423	0
676	148.4																					1212.7	646.7	1237.7	1550.7	-324.3	-54.3	-39.3	1381.7		1481.7	1663	11.8	422	0.3
676	148.6																							1209.7	1548.7	-325.3	-55.3	-40.3	1378.7		1478.7	1665	11.8	425	0.3
676	149.0																							1233.7	1537.7	-325.3	-53.3	-46.3	1374.7		1473.7	1666	12.7	426	1.2
676	149.1																							1232.9	1544.9	-323.1	-54.1	-46.1	1382.9		1482.9	1664	12.5	424	1
678	149.3																									-326.7	-50.7	-50.7	1379.4		1479.4	1665	13	425	1.5
681	149.5																									-325.7	-49.7	-51.7	1378.4		1481.4	1664	13	424	1.5
682	150.0																									-336.7	-48.7	-56.7	1366.4		1469.4	1670	13	430	1.5
682	150.1																															1670 s	13 s	430	1.5
684	150.1																															1670 s	13 s	430	1.5
684	150.1																															1670 s	13 s	430	1.5
684	150.1																									-324.7	-55.7	-56.7	1378.4		1473.4	1668	13 s	428	1.5
687	150.4																											-55.7	1394.4		1476.4	1669	13	429	1.5
688	150.5																														1472.8	1670	13.5	430	2
688	150.5																														1475.8	1668	13.5	428	2
688	150.6																														1469.3	1671	14	431	2.5
690	151.0																														1479.4	1674	13	434	1.5

(Corrected datas)

TEST SITE NO.1, PHALEN MINE

HIGH SIDE STEEL SETS (Corrected for calibration value and temperature)

Face # Support	Day Number	Mech. Strain gage Web 631	Mech. Strain gage Flange 631	Mech. Strain gage Web 635	Mech. Strain gage Flange 635	Mech. Strain gage Web 639	Mech. Strain gage Flange 639	Mech. Strain gage Web 644	Mech. Strain gage Flange 644	Mech. Strain gage Web 649	Mech. Strain gage Flange 649	Mech. Strain gage Web 653	Mech. Strain gage Flange 653	Mech. Strain gage Web 657	Mech. Strain gage Flange 657	Mech. Strain gage Web 661	Mech. Strain gage Flange 661	Mech. Strain gage Web 666	Mech. Strain gage Flange 666	Mech. Strain gage Web 669	Mech. Strain gage Flange 669	Mech. Strain gage Web 675	Mech. Strain gage Flange 675	Mech. Strain gage Web 679	Mech. Strain gage Flange 679	Mech. Strain gage Web 683	Mech. Strain gage Flange 683	Mech. Strain gage Web 687	Mech. Strain gage Flange 687	Mech. Strain gage Web 691	Mech. Strain gage Flange 691	Calibration	Temp. (celsius)	Difference with calibration	Difference with temperature
652	143.5											1217.0	660.0	1485.0	1358.0	-365.0	1467.0	1288.0	1231.0	-362.0	-41.0	1423.0	620.0	1178.0	1135.0	617.0	1429.0	625.0	1487.0	653.0	1460.0	1658	11.5	418	0
654	143.8													1485.6	1361.6	-376.4	1464.6	1291.6	1227.6	-364.4	-43.4	1426.6	617.6	1180.6	1135.6	621.6	1426.6	630.6	1482.6	655.6	1457.6	1658	11.9	418	0.4
655	143.9													1486.5	1366.5	-377.6	1467.5	1291.5	1229.5	-363.6	-39.6	1423.5	617.5	1178.5	1137.5	617.5	1427.5	628.5	1487.5	658.5	1458.5	1657	12	417	0.5
657	144.3													1481.0	1360.0	-381.0	1462.0	1290.0	1290.0	-360.0	-47.0	1425.0	622.0	1188.0	1199.0	615.0	1384.0	624.0	1483.0	655.0	1458.0	1660	11.5	420	0
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.4																																		
657	144.5																																		
657	144.5																																		
657	144.5																																		
657	144.5																																		
657	144.5																																		
657	144.5													1477.5	1357.5	-387.6	1455.5	1278.5	1222.5	-371.6	-55.6	1426.5	607.5	1187.5	1132.5	614.5	1417.5	600.5	1477.5	647.5	1452.5	1667	12	427	0.5
657	144.5																																		
657	144.6																																		
659	144.7																																		
659	144.7															-374.0	1466.0	1282.0	1226.0	-368.0	-47.0	1423.0	614.0	1177.0	1134.0	617.0	1424.0	621.0	1485.0	652.0	1457.0	1657	11.5	417	0
659	144.7																															1657 s	11.5 s	417	0
661	144.8																																		
664	144.8																	1291.0	1225.0		-45.0	1429.0	618.0	1180.0	1140.0	619.0	1430.0	630.0	1489.0	650.0	1459.0	1655	11.5	415	0
665	144.8																															1655 s	11.5 s	415	0
665	144.9																															1655 s	11.5 s	415	0
665	144.9																	1290.0	1430.0		-41.0	1438.0	621.0	1181.0	1139.0	620.0	1429.0	626.0	1487.0	657.0	1470.0	1656	11.5	416	0
666	145.4																															1656 s	11.5 s	416	0
668	145.4																	1293.0	1426.0		-45.0	1427.0	619.0	1179.0	1132.0	618.0	1426.0	623.0	1488.0	652.0	1457.0	1656	11.5	416	0
665	145.5																	1289.0	1427.0		-79.0	1430.0	618.0	1185.0	1136.0	619.0	1430.0	627.0	1487.0	658.0	1458.0	1657	11.5	417	0
666	145.8																				-31.0	1431.0	615.0		1135.0	621.0	1434.0	629.0	1489.0	659.0	1457.0	1655	11.5	415	0
666	145.8																																		
667	145.8																																		
667	145.8																																		
667	145.9																					1433.0	622.0	1180.0	1140.0	626.0	1436.0	629.0	1484.0	659.0	1461.0	1659	11.5	419	0
669	147.0																					1420.0	608.0	1176.0	1128.0	613.0	1422.0	618.0	1481.0	649.0	1450.0	1666	11.5	426	0
670	148.1																					1420.0	609.0	1176.0	1129.0	612.0	1420.0	620.0	1480.0	650.0	1452.0	1665	11.5	425	0
672	148.2																					1419.0	608.0	1177.0	1130.0	611.0	1422.0	621.0	1480.0	650.0	1452.0	1665	11.5	425	0
674	148.4																					1420.0	630.0	1179.0	1132.0	615.0	1428.0	621.0	1482.0	653.0	1453.0	1663	11.5	425	0
676	148.4																							1179.7	1120.7	609.7	1423.7	616.7	1478.7	646.7	1448.7	1663	11.8	423	0.3
676	148.6																							1178.7	1119.7	608.7	1420.7	615.7	1476.7	644.7	1447.7	1665	11.8	425	0.3
676	149.0																							1181.7	1127.7	607.7	1418.7	618.7	1472.7	644.7	1447.7	1666	12.7	426	1.2
676	149.1																							1174.9	1131.9	612.9	1421.9	620.9	1478.9	620.9	1452.9	1664	12.5	424	1
678	149.3																										1121.4	622.4	1487.4	651.4	1452.4	1665	13	425	1.5
681	149.5																										1123.4	622.4	1490.4	653.4	1455.4	1664	13	424	1.5
682	150.0																									601.4	1418.4	624.4	1488.4	634.4	1454.4	1670	13	430	1.5
682	150.1																															1670 s	13 s	430	1.5
684	150.1																															1670 s	13 s	430	1.5
684	150.1																															1670 s	13 s	430	1.5
684	150.1																									604.4	1420.4	624.4	1487.4	650.4	1445.4	1668	13 s	428	1.5
687	150.4																											626.4	1489.4	644.4	1440.4	1669	13	429	1.5
688	150.5																													641.8		1670	13.5	430	2
688	150.5																													640.8		1668	13.5	428	2
688	150.6																													639.3		1671	14	431	2.5
690	151																													638.4		1674	13	434	1.5

(Corrected datas)

TEST SITE NO.1. PHALEN MINE
LOW SIDE AXIAL LOAD

Face # Support	Day Number	gage 653	gage 657	gage 661	gage 666	gage 669	gage 675	gage 679	gage 683	gage 687
652	143.5	0	0	0	0	0	0	0	0	0
654	143.8		-3.4496	-3.4496	20.0704	20.0704	4.7904	20.0704	-19.1296	-26.9696
655	143.9		11.368	-19.992	11.368	-19.992	-35.672	11.368	3.528	-12.152
657	144.3		-39.2	-31.36	-7.84	15.68	62.72	106.32	54.88	-47.04
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.5									
657	144.5									
657	144.5									
657	144.5									
657	144.5									
657	144.5		-67.032	-40.552	-27.032	-35.672	34.888	-4.312	-54.352	-67.032
657	144.5									
657	144.6									
659	144.7									
659	144.7			-23.52	-15.68	-7.84	0	23.52	62.72	-7.84
659	144.7									
661	144.8									
661	144.8				-7.84	-23.52	-31.36	39.2	31.36	0
663	144.8									
663	144.9									
663	144.9				70.56	54.88	47.04	31.36		31.36
664	145.4									
664	145.4				15.68	0	-7.84	-7.84		-23.52
665	145.5				70.56	15.68	0	15.68		0
666	145.8				70.56	62.72	70.56	86.24		54.88
666	145.8									
667	145.8									
667	145.8									
667	145.9						70.56	117.6		54.88
669	147.0						-23.52	15.68	7.84	7.84
670	148.1						0	39.2	31.36	0
672	148.2						0	15.68	15.68	0
674	148.4						-7.84	7.84	23.52	-31.36
676	148.4						13.0928	13.0928	-10.4272	5.2528
676	148.6							-206.427	-10.2672	-2.5872
676	149.0							-18.1888	-18.1888	-49.5488
676	149.1							-24.304	-6.784	-47.824
678	149.3								-28.616	-83.496
681	149.5								-20.776	-91.336
682	150.0								-107.016	-139.536
682	150.1									
684	150.1									
684	150.1									
684	150.1								-91.336	-130.536
687	150.4									-122.696

TEST SITE NO.1. PHALEN MINE
LOW SIDE BENDING MOMENT

Face # Support	Day Number	gage 653	gage 657	gage 661	gage 666	gage 669	gage 675	gage 679	gage 683	gage 687
652	143.5	0	0	0	0	0	0	0	0	0
654	143.8		1.308	-0.654	0.327	1.308	0.654	0.327	-0.654	0.327
655	143.9		0.981	-0.327	0.654	-0.327	-1.962	-1.308	-4.4E-15	-0.327
657	144.3		0	-9.81	1.635	2.943	3.924	6.54	2.289	-1.308
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.5									
657	144.5									
657	144.5									
657	144.5									
657	144.5									
657	144.5		0.981	-7.848	1.962	0.654	4.905	0.981	0.981	0.327
657	144.5									
657	144.6									
659	144.7									
659	144.7			-0.327	1.962	-2.289	-0.327	0.654	1.308	-0.654
659	144.7									
661	144.8									
661	144.8				-0.327	0.327	0.327	1.635	1.962	1.635
663	144.8									
663	144.9									
663	144.9				1.962		-0.327	-4.251		
664	145.4									
664	145.4				1.962		0.654	0		
665	145.5				2.289		-0.327	-0.327		
666	145.8				1.962		0.654	-1.635		
666	145.8									
667	145.8									
667	145.8									
667	145.9						0.327	-3.27		
669	147.0						0.327	0	-2.616	1.962
670	148.1						-0.654	0	-1.962	0.654
672	148.2						-0.981	-0.654	-2.616	0.327
674	148.4						-0.327	-0.654	-2.616	0
676	148.4						-9.483	0.327	-4.578	1.635
676	148.6							-9.175	-4.578	2.289
676	149.0							3.27	-5.232	1.635
676	149.1							0.654	-4.251	-0.981
678	149.3								-6.54	-1.308
681	149.5								-6.54	-1.308
682	150.0								-10.464	0.981
682	150.1									
684	150.1									
684	150.1									
684	150.1								-7.521	-2.943
687	150.4									-7.848

TEST SITE NO.1, PHALEN MINE
LOW SIDE MAXIMUM STRESS

Face # Support	Day Number	gage 653	gage 657	gage 661	gage 666	gage 669	gage 675	gage 679	gage 683	gage 687
652	143.5	0	0	0	0	0	0	0	0	0
654	143.8		-9.20519	-5.05622	3.204027	-3.01943	-2.99438	3.204027	-9.18806	-9.16749
655	143.9		-3.23348	-7.33238	-1.15919	-7.33238	-21.8286	-5.38066	0.927864	-5.27046
657	144.3		-10.3096	-10.4023	-12.4348	-14.5465	-8.37809	5.9344	-0.68797	-20.6698
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.4									
657	144.5									
657	144.5									
657	144.5									
657	144.5									
657	144.5									
657	144.5		-23.8520	-73.6488	-19.7667	-13.5207	-21.9417	-7.35752	-19.7290	-19.7039
657	144.5									
657	144.6									
659	144.7									
659	144.7			-8.26924	-16.5707	-16.5833	-2.07448	2.036704	0.197408	-6.21089
659	144.7									
661	144.8									
661	144.8				-4.13640	-8.26924	-10.3221	-8.06284	-4.19924	-10.3724
663	144.8									
663	144.9									
663	144.9				6.110052		2.099332	-10.7286		
664	145.4									
664	145.4				-8.32308		-6.21089	-2.06192		
665	145.5				4.05864		-2.07448	2.099332		
666	145.8				6.110052		14.4830	12.3068		
666	145.8									
667	145.8									
667	145.8									
667	145.9						16.4879	10.10392		
669	147.0						-8.26628	4.12384	-14.5229	-10.3850
670	148.1						-4.10897	10.3096	-4.19924	-4.10897
672	148.2						-6.22396	-0.03513	-12.4720	-2.07448
674	148.4						-4.13640	-2.08705	-10.4100	-8.20768
676	148.4						-56.7167	1.340918	-31.7881	-8.97695
676	148.6							-106.152	-33.0071	-15.2048
676	149.0							-25.5285	-37.9758	-23.4837
676	149.1							-10.5409	-27.1795	-18.8011
678	149.3								-49.0157	-30.2574
681	149.5								-46.9538	-32.3195
682	150.0								-94.5288	-40.2544
682	150.1									
684	150.1									
684	150.1									
684	150.1								-71.7385	-53.0913
687	150.4									-82.0567

(Converted datas, as plotted on graphs, y-axis)

TEST SITE NO.1, PHALEN MINE

HIGH SIDE AXIAL LOAD

Face # Support	Day Number	Gage 653	Gage 657	Gage 661	Gage 665	Gage 669	Gage 675	Gage 679	Gage 683	Gage 687	Gage 691
652	143.5	0	0	0	0	0	0	0	0	0	0
654	143.8		4.3986	51.0386	27.9186	-19.129	27.9186	20.0786	35.7586	12.2386	20.0786
655	143.9		11.368	42.728	27.048	-12.152	3.528	3.528	3.528	27.048	42.728
657	144.3		-31.36	15.68	15.68	15.68	15.68	78.4	-15.68	-7.84	15.68
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.5										
657	144.5										
657	144.5										
657	144.5										
657	144.5										
657	144.5		-59.192	-35.672	-34.872	-34.872	27.048	34.888	-56.352	-192.47	-43.512
657	144.5										
657	144.6										
659	144.7										
659	144.7			70.56	-47.04	-47.04	0	-7.84	0	-31.36	0
659	144.7										
661	144.8										
661	144.8				23.52		47.04	15.68	15.68	39.2	39.2
663	144.8										
663	144.9										
663	144.9				15.68		54.88	23.52	23.52	7.84	31.36
664	145.4										
664	145.4				39.2		31.36	7.84	7.84	-15.68	15.68
665	145.5				7.84		54.88	39.2	15.68	15.68	39.2
666	145.8						62.72		31.36	31.36	47.04
666	145.8										
667	145.8										
667	145.8										
667	145.9						78.4	47.04	70.56	31.36	47.04
669	147.0						-23.52	-15.68	-31.36	-54.88	-31.36
670	148.1						-23.52	-15.68	-39.2	-39.2	-23.52
672	148.2						-31.36	-7.84	-31.36	-31.36	-23.52
674	148.4						39.2	7.84	-15.68	-31.36	0
676	148.4							13.0978	-57.467	-65.307	-49.627
676	148.6							5.2278	-65.307	-77.147	-65.307
676	149.0							20.0512	-77.068	-49.548	-65.228
676	149.1							-20.384	-72.144	-32.144	-16.464
678	149.3									-20.776	-12.936
680	149.5									-20.776	2.744
682	150.0								-122.49	-5.096	10.584
682	150.1										
684	150.1										
684	150.1										
684	150.1								-49.176	-5.096	-20.776
687	150.4									10.584	-67.896

TEST SITE NO.1, PHALEN MINE

HIGH SIDE BENDING MOMENT

Face # Support	Day Number	Gage 653	Gage 657	Gage 661	Gage 665	Gage 669	Gage 675	Gage 679	Gage 683	Gage 687	Gage 691
652	143.5	0	0	0	0	0	0	0	0	0	0
654	143.8		-0.981	2.943	2.289	0	1.962	-0.654	2.289	1.962	1.635
655	143.9		-2.289	1.635	1.635	-0.981	0.981	-0.654	0.654	0.981	2.289
657	144.3		-1.962	2.289	-2.289	2.616	0	-1.308	14.064	0.981	1.308
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.5										
657	144.5										
657	144.5										
657	144.5										
657	144.5										
657	144.5		-2.289	2.289	-0.327	1.635	5.232	3.924	1.635	-4.905	0.654
657	144.5										
657	144.6										
659	144.7										
659	144.7			3.27	-0.327	0	1.962	0	1.635	-0.654	0.981
659	144.7										
661	144.8										
661	144.8				2.943		2.616	-0.981	0.327	0.981	1.962
663	144.8										
663	144.9										
663	144.9				-44.439		1.962	-0.327	0.981	0.327	-1.962
664	145.4										
664	145.4				-62.13		1.635	0.981	1.308	-0.981	1.635
665	145.5				-65.765		2.943	1.308	0.327	0.654	2.289
666	145.8						4.251		-0.327	0.654	2.943
666	145.8										
667	145.8										
667	145.8										
667	145.9						2.616	0.327	0.654	2.289	1.635
669	147.0						2.943	1.635	0.981	-0.327	1.962
670	148.1						2.616	1.308	0	0.654	1.635
672	148.2						1.962	1.308	0.981	0.981	1.635
674	148.4						-4.578	4.578	-0.327	0.327	2.289
676	148.4							4.905	-0.654	4E-14	1.635
676	148.6							5.232	-4E-14	0.327	1.308
676	149.0							3.597	0.327	2.616	1.308
676	149.1							0	0.981	1.308	1.635
678	149.3									-0.981	1.962
680	149.5									-1.962	2.289
682	150.0								-1.635	-0.654	2.289
682	150.1										
684	150.1										
684	150.1										
684	150.1								-1.308	-0.327	3.924
687	150.4									-0.327	3.597

TEST SITE NO.1, PHALEN MINE

HIGH SIDE MAXIMUM STRESS

Face # Support	Day Number	Gage 653	Gage 657	Gage 661	Gage 665	Gage 669	Gage 675	Gage 679	Gage 683	Gage 687	Gage 691
652	143.5	0	0	0	0	0	0	0	0	0	0
654	143.8		-5.0687	-5.1441	-7.1897	-5.0300	-5.1064	1.12955	-5.1196	-4.2303	-5.0979
655	143.9		-11.530	0.86502	-3.2588	-4.0194	-5.2956	-3.2201	-3.2211	0.89466	-3.2879
657	144.3		-20.694	-10.397	-10.397	-12.472	4.12284	12.3212	-45.326	-8.2853	-4.1798
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.4										
657	144.5										
657	144.5										
657	144.5										
657	144.5										
657	144.5										
657	144.5		-30.488	-23.945	-21.765	-30.463	-26.678	-5.0087	-23.898	-81.737	-15.592
657	144.5										
657	144.6										
659	144.7										
659	144.7			-2.1976	-14.446	-12.371	-12.446	-2.0619	-10.372	-12.396	-6.2234
659	144.7										
661	144.8										
661	144.8				-12.888		-4.2243	-2.0996	2.04935	4.08613	-2.1373
663	144.8										
663	144.9										
663	144.9				-444.55		1.98651	4.11127	-0.8377	-4.0125	-4.1992
664	145.4										
664	145.4				-385.84		-2.1247	-4.1615	-6.2368	-10.387	-6.2986
665	145.5				-482.46		-4.2389	2.01164	2.04955	-0.8251	-4.2118
666	145.8						-10.472		6.17319	4.09578	-6.2988
666	145.8										
667	145.8										
667	145.8										
667	145.9						4.60529	10.2970	14.4085	-6.2737	1.99968
669	147.0						-24.856	-14.496	-14.471	-16.507	-20.694
670	148.1						-22.796	-12.421	-10.309	-14.458	-16.558
672	148.2						-20.694	-10.289	-14.471	-14.471	-16.558
674	148.4						-18.733	-26.980	-6.1985	-10.322	-14.521
676	148.4							-27.673	-19.262	-17.175	-23.426
676	148.6							-31.010	-17.175	-21.312	-25.475
676	149.0							-15.231	-21.291	-29.627	-25.455
676	149.1							-6.7999	-14.677	-16.758	-14.702
678	149.3									-11.667	-15.849
680	149.5									-17.911	-13.799
682	150.0								-42.641	-5.0892	-11.737
682	150.1										
684	150.1										
684	150.1										
684	150.1								-24.201	-2.0107	-36.337
687	150.4									6.2910	-40.659

(Converted datas, as plotted on graphs, y-axis)

APPENDIX 4

DATA SHEETS

TEST SITE NO. 2
(BETWEEN STEEL SETS 781 AND 844)
TOP GATEROAD
2 WEST PANEL
PHALEN MINE

TEST SITE NO.2, PHALEN MINE
CABLE SLINGS

Face # Support	Day Number	Tensmeg Gage 1 Sling 806.3	Tensmeg Gage 2 Sling 810.3	Tensmeg Gage 3 Sling 814.3	Tensmeg Gage 4 Sling 818.3	Tensmeg Gage 5 Sling 822.5
304	37.38					-15084
304	37.51					-14640
304	38.38			-10082	-13926	-14822
304	38.51			-9698	-12554	
304	39.38	-3841	-6029	-9889	-12628	-14865
304	39.51	-2621	-4536			
304	58.38	-2996	-4932	-10021	-12887	-15133
304	59.38					
448	92.45	-2869	-4935	-10062	-12836	-15122
460	94.46	-2838	-4920	-10055	-12830	-15121
485	100.31	-2862	-4940	-10058	-12830	-15120
498	102.36	-2875	-4950	-10064	-12844	-15141
533	110.49	-2886	-4963	-10063	-12866	-15156
533	114.36	-2914	-4985	-10070	-12883	-15169
561	121.54	-2903	-4972	-10062	-12875	-15175
608	150.99	-2866	-6259	-10081	-12795	-15274
734	170.36	-2698	-6140	-9820	-12581	-15076
734	170.47	-2678	-6123	-9814	-12586	-15083
746	172.38	-2702	-6141	-9821	-12572	-15065
746	172.43	-2673	-6117	-9806	-12560	-15060
765	177.80	-2718	-6150	-9780	-12521	-15019
782	179.01	-2609	-6116	-9674	-12415	-14927
784	179.69	-2520	-6064	-9602	-12379	-14913
786	179.83	-2378	-5996	-9528	-12335	-14901
786	179.88	-2389	-6002	-9534	-12348	-14912
788	180.00	-2274	-5949	-9450	-12325	-14953
788	180.02	-2222	-5915	-9427	-12316	-14967
790	180.19	-2169	-5875	-9369	-12316	-15007
790	180.24	-2141	-5862	-9361	-12322	-15028
790	180.73	-2049	-5767	-9195	-12154	-14793
791	180.83	-1994	-5747	-9222	-12200	-14898
791	180.88	-1969	-5727	-9216	-12200	-14911
791	184.42	-1516	-5243	-9400	-11825	-14565
793	184.54	-1465	-5243	-9449	-11944	-14888
792	185.69	-1217	-5083	-9228	-12032	-14580
792	185.90	-1102	-4999	-9154	-11994	-14480
793	186.33	-1043	-5178	-9130	-12088	-14580
793	186.49	-1034	-5768	-9174	-12081	-14610
793	186.67	-994	-5124	-9227	-12198	-14817
793	186.79	-948	-5077	-9222	-12288	-14865
795	187.32	-830	-4929	-9072	-11943	-14429
795	187.50	-788	-4842	-9018	-11948	-14588
795	187.65	-707	-4848	-9049	-11991	-14563
796	187.73	-655	-4822	-9052	-12040	-14683
796	187.85	-638	-4823	-9048	-12004	-14613
797	188.27	-605	-4795	-8989	-11896	-14445
797	188.31	-514	-4740	-8951	-11893	-14482
798	188.53	-348	-4667	-8964	-11989	-14681
799	188.67	-183	-4570	-8911	-11954	-14668
800	188.79	124	-4368	-8816	-11926	-14681
800	189.00	405	-4369	-8558	-11645	-14236
803	190.23	740	-4144	-8403	-11573	-14184
805	190.38	936	-3931	-8282	-11528	-14262
806	190.43	1025	-3786	-8184	-11495	-14242
807	190.54	1715	-3211	-7880	-11230	-14155
807	190.58	1903	-3108	-7792	-11275	-14257
809	191.21	2063	-2833	-7575	-11164	-14230
811	191.40	1402	-2966	-7002	-10891	-14148
812	191.42	1202	-2986	-6902	-10791	-14188
812	191.47		-2877	-6672	-10770	-14172
812	191.54		-2743	-6500	-10622	-14136
814	192.05		-2772	-6032	-10060	-13762
814	192.19		-2131	-5721	-9842	-13766
814	192.22		-1942	-5496	-9683	-13742
815	192.25		-1904	-5485	-9586	-13737
817	192.42		-2377	-4703	-9363	-13732
818	192.50		-2488	-3458	-8798	-13488
818	192.56		-4635	-3415	-7622	-13245
820	193.06		-4788	-3391	-6287	-13149
818	193.08		-4699	-3394	-6045	-12788
823	193.21		-4677	-3587	-3635	-12428
824	193.33		-4236	-3704	-3162	-11910
824	193.38		-4216	-3648	-3122	-11823
824	193.41		-3588	-3558	-3898	-12025
826	193.50		-3463	-3556	-3788	-12032
826	193.57		-3284	-3534	-5439	-12282
826	194.05		-3869	-3566	-4904	-11787
827	194.08		-3886	-3569	-6051	-12216
828	194.22		-2987	-3519	-6035	-12761
829	194.25		-2892	-3446	-6086	-14499
829	194.38		-2872	-3394	-6063	-14586
829	194.42		-2876	-3401	-6069	-14541
830	194.48		-2853	-3386	-6084	-14739
832	197.00		-3104	-3429	-6080	-11833
833	197.08		-3892	-3387	-6074	-11725
833	197.16		-3122	-3385	-6079	-12884
833	197.77		-3157	-3327	-6083	-12715
833	197.88		-3160	-3337	-6090	-12723
833	197.92		-3190	-3325	-6082	-12331
833	198.00		-3209	-3333	-6087	-12700
836	198.10		-3222	-3314	-6082	-12750
836	198.11		-3238	-3308	-6084	-12689
837	198.19		-3230	-3300	-6082	-12883

(Raw datas)

TEST SITE NO.2, PHALEN MINE
CABLE SLINGS

Face @ Support	Day Number	(kN) Gage 1 Sling 806.5	(kN) Gage 2 Sling 810.5	(kN) Gage 3 Sling 814.5	(kN) Gage 4 Sling 818.5	(kN) Gage 5 Sling 822.5
304	37.38					0
304	37.51					31.722
304	38.38			0	0	27.081
304	38.51			30.396	34.986	
304	39.38	0	0	27.3615	33.099	25.9845
304	39.51	31.11	38.0715			
304	58.38	21.5475	27.4635	21.9555	26.4945	19.1505
304	59.38					
448	92.45	24.786	27.897	20.91	27.795	19.431
460	94.46	25.5765	28.2795	21.0885	27.948	19.4565
485	100.31	24.9645	27.7695	21.012	27.948	19.482
498	102.36	24.633	27.5145	20.859	27.591	18.9465
533	110.49	24.3525	27.183	20.8845	27.03	18.564
533	114.36	23.6385	26.622	20.502	26.3965	18.2325
561	121.54	23.919	26.9535	20.91	26.8005	18.0795
608	150.99	24.8625	-5.865	22.4655	28.8405	15.555
734	170.36	29.1465	-2.0305	27.081	34.2975	29.604
734	170.47	29.6565	-2.397	27.234	34.17	28.4255
746	172.38	29.0445	-2.856	27.0555	34.527	29.8845
746	172.43	29.784	-2.244	27.438	34.833	21.012
765	177.40	28.6365	-3.0855	28.101	35.8275	22.0575
782	179.41	31.416	-2.2185	30.804	38.5305	24.4035
784	179.69	33.6855	-0.8925	32.64	39.4485	24.7605
786	179.83	37.3065	0.8415	34.527	40.5705	25.0665
786	179.88	37.026	0.6885	34.374	40.239	24.786
788	180.00	39.9585	2.04	36.516	40.8255	23.7405
788	180.02	41.2845	2.907	37.1025	41.055	23.3835
790	180.19	42.636	3.927	38.5815	41.055	22.3635
790	180.24	43.35	4.2585	38.7855	40.902	21.828
790	180.73	45.696	6.681	43.0185	45.186	27.8205
791	180.83	47.0985	7.191	42.33	44.013	25.143
791	180.88	47.736	7.701	42.483	44.013	24.8115
791	184.42	59.2875	20.043	37.791	53.5755	33.6345
793	184.54	60.588	20.043	36.5415	50.541	27.438
792	185.69	66.912	26.163	42.177	48.297	35.292
792	185.90	69.8445	28.56	44.064	49.266	35.802
793	186.33	71.349	21.7005	44.676	48.909	35.292
793	186.49	71.5785	6.6555	43.554	47.0475	32.487
793	186.67	72.5985	23.0775	42.2025	44.268	27.2085
793	186.79	73.7715	24.276	42.33	43.809	25.9845
795	187.32	76.7805	28.05	46.155	50.5665	37.1025
795	187.50	79.0915	30.2685	47.532	50.439	35.088
795	187.65	79.917	30.1155	46.7415	49.3425	33.6855
796	187.73	81.243	30.7785	46.665	48.093	30.6255
796	187.85	81.6765	30.753	46.767	49.011	32.4105
797	188.27	82.518	31.467	48.2715	51.765	36.6945
797	188.31	84.8385	32.8695	49.2405	51.8415	35.751
798	188.53	89.0715	34.731	48.909	49.3935	30.6765
799	188.67	93.279	37.2045	50.2605	50.286	31.008
800	188.79	101.1075	42.3555	52.683	51	30.6765
800	189.00	108.273	42.33	59.262	58.1655	42.024
803	190.23	116.8155	48.0675	63.2145	60.0015	43.35
805	190.38	121.8135	53.499	66.3	61.149	41.361
806	190.43	124.083	57.1965	68.799	61.9905	41.871
807	190.54	141.678	71.859	78.591	68.748	44.0895
807	190.58	146.472	74.4855	78.795	67.6005	41.4885
809	191.21	150.552	81.498	84.3285	70.431	42.177
811	191.40	133.6965	78.1065	98.94	77.3925	44.268
812	191.42	128.5965	79.6365	101.49	79.9425	43.248
812	191.47		80.376	106.845	80.274	43.656
812	191.54		83.793	111.741	84.252	44.574
814	192.05		83.0535	123.675	98.583	54.111
814	192.19		98.889	131.6055	104.142	54.009
814	192.22		104.2185	137.343	108.1965	54.621
815	192.25		105.1875	137.6235	112.71	54.7485
817	192.42		93.126	157.5645	116.3565	54.876
818	192.50		92.5395	162.05	130.968	61.302
818	192.56		35.547	163.088	160.752	67.2945
820	193.21		33.8895	191.0205	164.231	69.7425
818	193.06		33.915	163.224	160.51	81.192
823	193.21		34.476	161.937	170.417	88.128
824	193.33		45.7215	161.157	177.8	101.337
824	193.38		46.2315	161.53	177.972	103.5555
824	193.41		62.2455	162.13	175.528	98.4045
826	193.50		65.382	162.144	176.194	98.226
826	193.57		72.0375	162.29	168.86	91.851
826	194.05		75.48	162.077	172.194	106.5135
827	194.08		77.0865	162.057	165.804	[illegible]
828	194.22		79.611	162.39	165.777	79.6365
829	194.25		79.9935	162.877	165.571	35.3175
829	194.38		80.5035	163.224	165.724	35.139
829	194.42		80.4015	163.177	165.604	34.2465
830	194.48		80.988	163.277	165.504	29.1975
832	197.00		74.5875	162.99	165.611	103.3005
833	197.08		74.0935	163.27	165.651	106.0545
833	197.16		74.1285	163.284	165.617	98.94
833	197.77		73.236	163.67	165.591	88.0095
833	197.88		73.1595	163.604	165.544	88.6035
833	197.92		72.3945	163.604	165.597	90.0915
833	198.00		71.9355	163.63	165.564	81.192
836	198.10		71.5785	163.757	165.597	79.917
836	198.11		71.1705	163.797	165.584	81.4725
837	198.19		71.3745	163.85	165.597	76.5255

(Converted datas, as plotted on graphs, y-axis)

TEST SITE NO.1, PHALEN MINE

Distance from longwall face (m)

Face # Support	Day Number	Sling 006.5	Sling 010.5	Sling 014.5	Sling 018.5	Sling 022.5
304	37.38	-502.50	-506.50	-510.50	-514.50	-518.50
304	37.51	-502.50	-506.50	-510.50	-514.50	-518.50
304	38.38	-502.50	-506.50	-510.50	-514.50	-518.50
304	38.51	-502.50	-506.50	-510.50	-514.50	-518.50
304	39.38	-502.50	-506.50	-510.50	-514.50	-518.50
304	39.51	-502.50	-506.50	-510.50	-514.50	-518.50
304	58.38	-502.50	-506.50	-510.50	-514.50	-518.50
304	59.38	-502.50	-506.50	-510.50	-514.50	-518.50
448	92.45	-358.50	-362.50	-366.50	-370.50	-374.50
460	99.46	-346.50	-350.50	-354.50	-358.50	-362.50
485	100.31	-321.50	-325.50	-329.50	-333.50	-337.50
498	102.36	-308.50	-312.50	-316.50	-320.50	-324.50
533	110.49	-273.50	-277.50	-281.50	-285.50	-289.50
533	114.36	-273.50	-277.50	-281.50	-285.50	-289.50
561	121.54	-245.50	-249.50	-253.50	-257.50	-261.50
688	150.99	-118.50	-122.50	-126.50	-130.50	-134.50
734	170.36	-72.50	-76.50	-80.50	-84.50	-88.50
734	170.47	-72.50	-76.50	-80.50	-84.50	-88.50
744	172.38	-60.50	-64.50	-68.50	-72.50	-76.50
744	172.43	-60.50	-64.50	-68.50	-72.50	-76.50
765	177.48	-41.50	-45.50	-49.50	-53.50	-57.50
782	179.41	-24.50	-28.50	-32.50	-36.50	-40.50
784	179.69	-22.50	-26.50	-30.50	-34.50	-38.50
786	179.83	-20.50	-24.50	-28.50	-32.50	-36.50
786	179.88	-20.50	-24.50	-28.50	-32.50	-36.50
788	180.00	-18.50	-22.50	-26.50	-30.50	-34.50
788	180.02	-18.50	-22.50	-26.50	-30.50	-34.50
790	180.19	-16.50	-20.50	-24.50	-28.50	-32.50
790	180.24	-16.50	-20.50	-24.50	-28.50	-32.50
790	180.73	-16.50	-20.50	-24.50	-28.50	-32.50
791	180.83	-15.50	-19.50	-23.50	-27.50	-31.50
791	180.88	-15.50	-19.50	-23.50	-27.50	-31.50
791	184.42	-15.50	-19.50	-23.50	-27.50	-31.50
793	184.54	-13.50	-17.50	-21.50	-25.50	-29.50
792	185.69	-14.50	-18.50	-22.50	-26.50	-30.50
792	185.90	-14.50	-18.50	-22.50	-26.50	-30.50
793	186.33	-13.50	-17.50	-21.50	-25.50	-29.50
793	186.49	-13.50	-17.50	-21.50	-25.50	-29.50
793	186.67	-13.50	-17.50	-21.50	-25.50	-29.50
793	186.79	-13.50	-17.50	-21.50	-25.50	-29.50
795	187.32	-11.50	-15.50	-19.50	-23.50	-27.50
795	187.50	-11.50	-15.50	-19.50	-23.50	-27.50
795	187.65	-11.50	-15.50	-19.50	-23.50	-27.50
796	187.73	-10.50	-14.50	-18.50	-22.50	-26.50
796	187.85	-10.50	-14.50	-18.50	-22.50	-26.50
797	188.27	-9.50	-13.50	-17.50	-21.50	-25.50
797	188.31	-9.50	-13.50	-17.50	-21.50	-25.50
798	188.53	-8.50	-12.50	-16.50	-20.50	-24.50
799	188.67	-7.50	-11.50	-15.50	-19.50	-23.50
800	188.79	-6.50	-10.50	-14.50	-18.50	-22.50
800	189.00	-6.50	-10.50	-14.50	-18.50	-22.50
803	190.23	-3.50	-7.50	-11.50	-15.50	-19.50
805	190.38	-1.50	-5.50	-9.50	-13.50	-17.50
800	190.43	-6.50	-10.50	-14.50	-18.50	-22.50
807	190.54	0.50	-3.50	-7.50	-11.50	-15.50
807	190.58	0.50	-3.50	-7.50	-11.50	-15.50
809	191.21	2.50	-1.50	-5.50	-9.50	-13.50
811	191.40	4.50	0.50	-3.50	-7.50	-11.50
812	191.42	5.50	1.50	-2.50	-6.50	-10.50
812	191.47	5.50	1.50	-2.50	-6.50	-10.50
812	191.54	5.50	1.50	-2.50	-6.50	-10.50
814	192.05	7.50	3.50	-0.50	-4.50	-8.50
814	192.19	7.50	3.50	-0.50	-4.50	-8.50
814	192.22	7.50	3.50	-0.50	-4.50	-8.50
815	192.25	8.50	4.50	0.50	-3.50	-7.50
817	192.42	10.50	6.50	2.50	-1.50	-5.50
818	192.50	11.50	7.50	3.50	-0.50	-4.50
818	192.56	11.50	7.50	3.50	-0.50	-4.50
818	193.06	11.50	7.50	3.50	-0.50	-4.50
820	193.21	13.50	9.50	5.50	1.50	-2.50
823	193.21	16.50	12.50	8.50	4.50	0.50
824	193.33	17.50	13.50	9.50	5.50	1.50
824	193.38	17.50	13.50	9.50	5.50	1.50
824	193.41	17.50	13.50	9.50	5.50	1.50
826	193.50	19.50	15.50	11.50	7.50	3.50
826	193.57	19.50	15.50	11.50	7.50	3.50
826	194.05	19.50	15.50	11.50	7.50	3.50
827	194.08	20.50	16.50	12.50	8.50	4.50
828	194.22	21.50	17.50	13.50	9.50	5.50
829	194.25	22.50	18.50	14.50	10.50	6.50
829	194.38	22.50	18.50	14.50	10.50	6.50
829	194.42	22.50	18.50	14.50	10.50	6.50
830	194.48	23.50	19.50	15.50	11.50	7.50
832	197.00	25.50	21.50	17.50	13.50	9.50
833	197.08	26.50	22.50	18.50	14.50	10.50
833	197.16	26.50	22.50	18.50	14.50	10.50
833	197.77	26.50	22.50	18.50	14.50	10.50
833	197.88	26.50	22.50	18.50	14.50	10.50
833	197.92	26.50	22.50	18.50	14.50	10.50
833	198.00	26.50	22.50	18.50	14.50	10.50
836	198.10	29.50	25.50	21.50	17.50	13.50
836	198.11	29.50	25.50	21.50	17.50	13.50
837	198.19	30.50	26.50	22.50	18.50	14.50
837	198.69	30.50	26.50	22.50	18.50	14.50
838	198.79	31.50	27.50	23.50	19.50	15.50
839	198.90	32.50	28.50	24.50	20.50	16.50
839	199.05	32.50	28.50	24.50	20.50	16.50
839	199.15	32.50	28.50	24.50	20.50	16.50
840	199.25	33.50	29.50	25.50	21.50	17.50
840	199.67	33.50	29.50	25.50	21.50	17.50
841	199.88	34.50	30.50	26.50	22.50	18.50
842	199.89	35.50	31.50	27.50	23.50	19.50
842	199.99	35.50	31.50	27.50	23.50	19.50
842	200.08	35.50	31.50	27.50	23.50	19.50
844	200.11	37.50	33.50	29.50	25.50	21.50
844	200.16	37.50	33.50	29.50	25.50	21.50
844	200.21	37.50	33.50	29.50	25.50	21.50

(Plotted on graphs, x-axis)

TEST SITE NO.2. PHALEN MINE

Distance from longwall face (m)

Face @ Support	Day Number	Support 781	Support 786	Support 791	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.68	3.00	-2.00	-7.00	-12.00	-16.00	-22.00	-26.00	-30.00	-34.00	-38.00	-44.00	-48.00	-52.00	-56.00	-60.00
786	179.87	5.00	0.00	-5.00	-10.00	-14.00	-20.00	-24.00	-28.00	-32.00	-36.00	-42.00	-46.00	-50.00	-54.00	-58.00
786	179.88	5.00	0.00	-5.00	-10.00	-14.00	-20.00	-24.00	-28.00	-32.00	-36.00	-42.00	-46.00	-50.00	-54.00	-58.00
788	[illegible]	7.00	2.00	-3.00	-8.00	-12.00	-18.00	-22.00	-26.00	-30.00	-34.00	-40.00	-44.00	-48.00	-52.00	-56.00
788	180.62	7.00	2.00	-3.00	-8.00	-12.00	-18.00	-22.00	-26.00	-30.00	-34.00	-40.00	-44.00	-48.00	-52.00	-56.00
790	181.15	9.00	4.00	-1.00	-6.00	-10.00	-16.00	-20.00	-24.00	-28.00	-32.00	-38.00	-42.00	-46.00	-50.00	-54.00
790	181.24	9.00	4.00	-1.00	-6.00	-10.00	-16.00	-20.00	-24.00	-28.00	-32.00	-38.00	-42.00	-46.00	-50.00	-54.00
790	183.72	9.00	4.00	-1.00	-6.00	-10.00	-16.00	-20.00	-24.00	-28.00	-32.00	-38.00	-42.00	-46.00	-50.00	-54.00
791	183.83	10.00	5.00	0.00	-5.00	-9.00	-15.00	-19.00	-23.00	-27.00	-31.00	-37.00	-41.00	-45.00	-49.00	-53.00
791	183.88	10.00	5.00	0.00	-5.00	-9.00	-15.00	-19.00	-23.00	-27.00	-31.00	-37.00	-41.00	-45.00	-49.00	-53.00
791	184.42	10.00	5.00	0.00	-5.00	-9.00	-15.00	-19.00	-23.00	-27.00	-31.00	-37.00	-41.00	-45.00	-49.00	-53.00
793	184.54	12.00	7.00	2.00	-3.00	-7.00	-13.00	-17.00	-21.00	-25.00	-29.00	-35.00	-39.00	-43.00	-47.00	-51.00
792	185.65	11.00	6.00	1.00	-4.00	-8.00	-14.00	-18.00	-22.00	-26.00	-30.00	-36.00	-40.00	-44.00	-48.00	-52.00
792	185.93	11.00	6.00	1.00	-4.00	-8.00	-14.00	-18.00	-22.00	-26.00	-30.00	-36.00	-40.00	-44.00	-48.00	-52.00
793	186.33	12.00	7.00	2.00	-3.00	-7.00	-13.00	-17.00	-21.00	-25.00	-29.00	-35.00	-39.00	-43.00	-47.00	-51.00
793	186.49	12.00	7.00	2.00	-3.00	-7.00	-13.00	-17.00	-21.00	-25.00	-29.00	-35.00	-39.00	-43.00	-47.00	-51.00
793	186.67	12.00	7.00	2.00	-3.00	-7.00	-13.00	-17.00	-21.00	-25.00	-29.00	-35.00	-39.00	-43.00	-47.00	-51.00
793	186.79	12.00	7.00	2.00	-3.00	-7.00	-13.00	-17.00	-21.00	-25.00	-29.00	-35.00	-39.00	-43.00	-47.00	-51.00
795	187.32	14.00	9.00	4.00	-1.00	-5.00	-11.00	-15.00	-19.00	-23.00	-27.00	-33.00	-37.00	-41.00	-45.00	-49.00
795	187.50	14.00	9.00	4.00	-1.00	-5.00	-11.00	-15.00	-19.00	-23.00	-27.00	-33.00	-37.00	-41.00	-45.00	-49.00
795	187.65	14.00	9.00	4.00	-1.00	-5.00	-11.00	-15.00	-19.00	-23.00	-27.00	-33.00	-37.00	-41.00	-45.00	-49.00
796	187.73	15.00	10.00	5.00	0.00	-4.00	-10.00	-14.00	-18.00	-22.00	-26.00	-32.00	-36.00	-40.00	-44.00	-48.00
796	187.85	15.00	10.00	5.00	0.00	-4.00	-10.00	-14.00	-18.00	-22.00	-26.00	-32.00	-36.00	-40.00	-44.00	-48.00
797	188.27	16.00	11.00	6.00	1.00	-3.00	-9.00	-13.00	-17.00	-21.00	-25.00	-31.00	-35.00	-39.00	-43.00	-47.00
797	188.31	16.00	11.00	6.00	1.00	-3.00	-9.00	-13.00	-17.00	-21.00	-25.00	-31.00	-35.00	-39.00	-43.00	-47.00
798	188.53	17.00	12.00	7.00	2.00	-2.00	-8.00	-12.00	-16.00	-20.00	-24.00	-30.00	-34.00	-38.00	-42.00	-46.00
799	188.67	18.00	13.00	8.00	3.00	-1.00	-7.00	-11.00	-15.00	-19.00	-23.00	-29.00	-33.00	-37.00	-41.00	-45.00
800	188.75	19.00	14.00	9.00	4.00	0.00	-6.00	-10.00	-14.00	-18.00	-22.00	-28.00	-32.00	-36.00	-40.00	-44.00
800	189.00	19.00	14.00	9.00	4.00	0.00	-6.00	-10.00	-14.00	-18.00	-22.00	-28.00	-32.00	-36.00	-40.00	-44.00
803	190.22	22.00	17.00	12.00	7.00	3.00	-3.00	-7.00	-11.00	-15.00	-19.00	-25.00	-29.00	-33.00	-37.00	-41.00
805	190.36	24.00	19.00	14.00	9.00	5.00	-1.00	-5.00	-9.00	-13.00	-17.00	-23.00	-27.00	-31.00	-35.00	-39.00
800	190.43	19.00	14.00	9.00	4.00	0.00	-6.00	-10.00	-14.00	-18.00	-22.00	-28.00	-32.00	-36.00	-40.00	-44.00
807	190.54	26.00	21.00	16.00	11.00	7.00	1.00	-3.00	-7.00	-11.00	-15.00	-21.00	-25.00	-29.00	-33.00	-37.00
807	190.58	26.00	21.00	16.00	11.00	7.00	1.00	-3.00	-7.00	-11.00	-15.00	-21.00	-25.00	-29.00	-33.00	-37.00
809	191.21	28.00	23.00	18.00	13.00	9.00	3.00	-1.00	-5.00	-9.00	-13.00	-19.00	-23.00	-27.00	-31.00	-35.00
811	191.40	30.00	25.00	20.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00	-17.00	-21.00	-25.00	-29.00	-33.00
812	191.42	31.00	26.00	21.00	16.00	12.00	6.00	2.00	-2.00	-6.00	-10.00	-16.00	-20.00	-24.00	-28.00	-32.00
812	191.47	31.00	26.00	21.00	16.00	12.00	6.00	2.00	-2.00	-6.00	-10.00	-16.00	-20.00	-24.00	-28.00	-32.00
812	191.54	31.00	26.00	21.00	16.00	12.00	6.00	2.00	-2.00	-6.00	-10.00	-16.00	-20.00	-24.00	-28.00	-32.00
814	192.05	33.00	28.00	23.00	18.00	14.00	8.00	4.00	0.00	-4.00	-8.00	-14.00	-18.00	-22.00	-26.00	-30.00
814	192.19	33.00	28.00	23.00	18.00	14.00	8.00	4.00	0.00	-4.00	-8.00	-14.00	-18.00	-22.00	-26.00	-30.00
814	192.22	33.00	28.00	23.00	18.00	14.00	8.00	4.00	0.00	-4.00	-8.00	-14.00	-18.00	-22.00	-26.00	-30.00
815	192.29	34.00	29.00	24.00	19.00	15.00	9.00	5.00	1.00	-3.00	-7.00	-13.00	-17.00	-21.00	-25.00	-29.00
817	192.43	36.00	31.00	26.00	21.00	17.00	11.00	7.00	3.00	-1.00	-5.00	-11.00	-15.00	-19.00	-23.00	-27.00
818	192.50	37.00	32.00	27.00	22.00	18.00	12.00	8.00	4.00	0.00	-4.00	-10.00	-14.00	-18.00	-22.00	-26.00
818	192.56	37.00	32.00	27.00	22.00	18.00	12.00	8.00	4.00	0.00	-4.00	-10.00	-14.00	-18.00	-22.00	-26.00
820	193.22	39.00	34.00	29.00	24.00	20.00	14.00	10.00	6.00	2.00	-2.00	-8.00	-12.00	-16.00	-20.00	-24.00
818	193.06	37.00	32.00	27.00	22.00	18.00	12.00	8.00	4.00	0.00	-4.00	-10.00	-14.00	-18.00	-22.00	-26.00
823	193.21	42.00	37.00	32.00	27.00	23.00	17.00	13.00	9.00	5.00	1.00	-5.00	-9.00	-13.00	-17.00	-21.00
824	193.27	43.00	38.00	33.00	28.00	24.00	18.00	14.00	10.00	6.00	2.00	-4.00	-8.00	-12.00	-16.00	-20.00
824	193.35	43.00	38.00	33.00	28.00	24.00	18.00	14.00	10.00	6.00	2.00	-4.00	-8.00	-12.00	-16.00	-20.00
824	193.41	43.00	38.00	33.00	28.00	24.00	18.00	14.00	10.00	6.00	2.00	-4.00	-8.00	-12.00	-16.00	-20.00
826	193.50	45.00	40.00	35.00	30.00	26.00	20.00	16.00	12.00	8.00	4.00	-2.00	-6.00	-10.00	-14.00	-18.00
826	193.57	45.00	40.00	35.00	30.00	26.00	20.00	16.00	12.00	8.00	4.00	-2.00	-6.00	-10.00	-14.00	-18.00
826	194.05	45.00	40.00	35.00	30.00	26.00	20.00	16.00	12.00	8.00	4.00	-2.00	-6.00	-10.00	-14.00	-18.00
827	194.08	46.00	41.00	36.00	31.00	27.00	21.00	17.00	13.00	9.00	5.00	-1.00	-5.00	-9.00	-13.00	-17.00
828	194.22	47.00	42.00	37.00	32.00	28.00	22.00	18.00	14.00	10.00	6.00	0.00	-4.00	-8.00	-12.00	-16.00
829	194.25	48.00	43.00	38.00	33.00	29.00	23.00	19.00	15.00	11.00	7.00	1.00	-3.00	-7.00	-11.00	-15.00
829	194.38	48.00	43.00	38.00	33.00	29.00	23.00	19.00	15.00	11.00	7.00	1.00	-3.00	-7.00	-11.00	-15.00
829	194.42	48.00	43.00	38.00	33.00	29.00	23.00	19.00	15.00	11.00	7.00	1.00	-3.00	-7.00	-11.00	-15.00
830	194.48	49.00	44.00	39.00	34.00	30.00	24.00	20.00	16.00	12.00	8.00	2.00	-2.00	-6.00	-10.00	-14.00
832	197.00	51.00	46.00	41.00	36.00	32.00	26.00	22.00	18.00	14.00	10.00	4.00	0.00	-4.00	-8.00	-12.00
833	197.08	52.00	47.00	42.00	37.00	33.00	27.00	23.00	19.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00
833	197.16	52.00	47.00	42.00	37.00	33.00	27.00	23.00	19.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00
833	197.77	52.00	47.00	42.00	37.00	33.00	27.00	23.00	19.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00
833	197.88	52.00	47.00	42.00	37.00	33.00	27.00	23.00	19.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00
833	197.92	52.00	47.00	42.00	37.00	33.00	27.00	23.00	19.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00
833	198.05	52.00	47.00	42.00	37.00	33.00	27.00	23.00	19.00	15.00	11.00	5.00	1.00	-3.00	-7.00	-11.00
836	198.10	55.00	50.00	45.00	40.00	36.00	30.00	26.00	22.00	18.00	14.00	8.00	4.00	0.00	-4.00	-8.00
836	198.11	55.00	50.00	45.00	40.00	36.00	30.00	26.00	22.00	18.00	14.00	8.00	4.00	0.00	-4.00	-8.00
837	198.19	56.00	51.00	46.00	41.00	37.00	31.00	27.00	23.00	19.00	15.00	9.00	5.00	1.00	-3.00	-7.00
837	198.69	56.00	51.00	46.00	41.00	37.00	31.00	27.00	23.00	19.00	15.00	9.00	5.00	1.00	-3.00	-7.00
838	198.79	57.00	52.00	47.00	42.00	38.00	32.00	28.00	24.00	20.00	16.00	10.00	6.00	2.00	-2.00	-6.00
839	198.96	58.00	53.00	48.00	43.00	39.00	33.00	29.00	25.00	21.00	17.00	11.00	7.00	3.00	-1.00	-5.00
839	199.05	58.00	53.00	48.00	43.00	39.00	33.00	29.00	25.00	21.00	17.00	11.00	7.00	3.00	-1.00	-5.00
839	199.15	58.00	53.00	48.00	43.00	39.00	33.00	29.00	25.00	21.00	17.00	11.00	7.00	3.00	-1.00	-5.00
840	199.25	59.00	54.00	49.00	44.00	40.00	34.00	30.00	26.00	22.00	18.00	12.00	8.00	4.00	0.00	-4.00
840	199.67	59.00	54.00	49.00	44.00	40.00	34.00	30.00	26.00	22.00	18.00	12.00	8.00	4.00	0.00	-4.00
841	199.86	60.00	55.00	50.00	45.00	41.00	35.00	31.00	27.00	23.00	19.00	13.00	9.00	5.00	1.00	-3.00
842	199.89	61.00	56.00	51.00	46.00	42.00	36.00	32.00	28.00	24.00	20.00	14.00	10.00	6.00	2.00	-2.00
842	199.99	61.00	56.00	51.00	46.00	42.00	36.00	32.00	28.00	24.00	20.00	14.00	16.00	6.00	2.00	-2.00
842	200.08	61.00	56.00	51.00	46.00	42.00	36.00	32.00	28.00	24.00	20.00	14.00	10.00	6.00	2.00	-2.00
844	200.11	63.00	58.00	53.00	48.00	44.00	38.00	34.00	30.00	26.00	22.00	16.00	12.00	8.00	4.00	0.00
844	200.16	63.00	58.00	53.00	48.00	44.00	38.00	34.00	30.00	26.00	22.00	16.00	12.00	8.00	4.00	0.00
844	200.21	63.00	58.00	53.00	48.00	44.00	38.00	34.00	30.00	26.00	22.00	16.00	12.00	8.00	4.00	0.00

(Plotted on graphs, x-axis)

TEST SIDE NO.2, PHALEN MINE
HEIGHT CONVERGENCE MEASUREMENTS

Face # Support	Bay Number	Convergence (height) Support 781	Convergence (height) Support 786	Convergence (height) Support 791	Convergence (height) Support 796	Convergence (height) Support 800	Convergence (height) Support 806	Convergence (height) Support 810	Convergence (height) Support 814	Convergence (height) Support 818	Convergence (height) Support 822	Convergence (height) Support 828	Convergence (height) Support 832	Convergence (height) Support 836	Convergence (height) Support 840	Convergence (height) Support 844
304	33.30	2.880	2.830	2.650	2.600	2.790	2.795	2.825	2.750	2.780	2.780	2.720	2.720	2.550	2.610	2.480
304	37.30															
304	38.30															
304	39.30															
304	50.30	2.89	2.835	2.655	2.63	2.78	2.8	2.835	2.76	2.785	2.79	2.72	2.72	2.56	2.61	2.48
304	59.30															
448	92.45	2.885	2.845	2.65	2.63	2.785	2.815	2.84	2.78	2.805	2.8	2.725	2.715	2.565	2.615	2.485
460	94.46	2.89	2.835	2.65	2.63	2.785	2.8	2.84	2.76	2.79	2.785	2.72	2.72	2.555	2.62	2.48
485	100.31	2.895	2.825	2.65	2.63	2.78	2.8	2.835	2.76	2.785	2.785	2.715	2.725	2.555	2.615	2.48
498	102.36	2.885	2.83	2.645	2.63	2.785	2.78	2.845	2.75	2.785	2.79	2.72	2.72	2.56	2.615	2.48
533	110.49															
533	114.36	2.9	2.815	2.655	2.625	2.775	2.8	2.83	2.745	2.775	2.78	2.715	2.715	2.55	2.61	2.47
561	121.54	2.895	2.83	2.645	2.625	2.77	2.795	2.835	2.75	2.775	2.775	2.71	2.72	2.55	2.61	2.47
600	150.99	2.876	2.835	2.637	2.617	2.768	2.788	2.83	2.751	2.782	2.775	2.71	2.712	2.537	2.598	2.471
734	170.36	2.865	2.817	2.625	2.6075	2.758	2.784	2.825	2.74	2.767	2.765	2.703	2.698	2.53	2.595	2.465
734	170.47															
746	172.38	2.8625	2.815	2.6225	2.605	2.755	2.7825	2.8225	2.74	2.765	2.765	2.705	2.7	2.5325	2.5925	2.4625
746	172.43															
765	177.40		2.8125	2.605	2.5925	2.7475	2.775	2.82	2.7375	2.76	2.76	2.705	2.6975	2.53	2.59	2.465
782	179.41			2.54	2.5475			2.815	2.73	2.755	2.755	2.7025	2.6975	2.5275	2.59	2.465
784	179.69			2.5725	2.5275	2.71		2.815	2.7275	2.7525	2.7525	2.6925	2.6975	2.5275	2.5875	2.465
786	179.83				2.4975	2.7		2.815	2.725	2.75	2.755	2.6925	2.6975	2.5275	2.5875	2.465
786	179.88															
788	180.00			2.4025	2.495	2.6775			2.725	2.7475	2.75	2.6975	2.6975	2.5275	2.5875	2.465
788	180.02															
790	180.19					2.6575			2.725	2.7475	2.7475	2.695	2.6975	2.5275	2.5875	2.465
790	180.24															
790	180.73					2.632			2.718	2.738	2.745	2.695	2.7	2.532	2.587	2.465
791	180.83					2.620			2.715	2.745	2.744	2.695	2.695	2.525	2.592	2.459
791	180.88															
791	184.42			2.133		2.561										
793	184.54									2.723	2.725	2.691	2.695	2.525	2.588	2.463
792	185.69									2.724	2.727	2.693	2.692	2.525	2.586	2.464
792	185.90									2.725	2.722	2.69	2.695	2.525	2.55	2.4575
793	186.33									2.7225	2.722	2.69	2.695	2.5225	2.5	2.46
793	186.49									2.721	2.726	2.688	2.693	2.523	2.585	2.459
793	186.67									2.711	2.725	2.689	2.682	2.525	2.588	2.462
793	186.79															
795	187.32															
795	187.50										2.715	2.685	2.685	2.52	2.585	2.4575
795	187.65										2.715	2.6825	2.68	2.5225	2.585	2.455
796	187.73															
796	187.85										2.719	2.687	2.691	2.518	2.587	2.461
797	188.27															
797	188.31										2.715	2.68	2.695	2.531	2.595	2.462
798	188.53															
799	188.67															
800	188.79											2.68	2.69	2.524	2.595	2.458
800	189.00															
803	190.23													2.519	2.5825	2.4575
805	190.30													2.525	2.5825	2.4575
806	190.43													2.52	2.5825	2.4575
807	190.54															
807	190.58													2.517	2.587	2.465
809	191.21															
811	191.40														2.585	2.455
812	191.42														2.586	2.458
812	191.47														2.585	2.456
812	191.54															
814	192.05															
814	192.19														2.5825	2.4575
814	192.22															
815	192.25															
817	192.42															
818	192.50														2.575	2.455
818	192.56														2.5725	2.455
820	193.06															2.452

(Raw datas)

TEST SIDE NO.2, PHALEN MINE
HEIGHT CONVERGENCE (mm)

(Converted datas, as plotted on graphs, y-axis)

Face # Support	Bar Number	Support 781	Support 786	Support 791	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
304	33.30															
304	33.30															
304	37.30															
304	38.30															
304	39.30	10	5	5	-250	-10	5	10	10	5	10	0	0	10	0	0
304	58.30															
440	59.30	5	15	0	-250	-5	20	15	30	25	20	5	-5	15	5	5
460	92.45	10	5	0	-250	-5	5	15	10	10	5	0	0	5	10	0
485	94.46	15	-5	0	-250	-10	5	10	10	5	5	-5	5	5	5	0
490	100.31	5	0	-5	-250	-5	-15	20	0	5	10	0	0	10	5	0
533	102.36															
533	110.49	20	-15	5	-255	-15	5	5	-5	-5	0	-5	-5	0	0	-10
561	114.36	15	0	-5	-255	-20	0	10	0	-5	-5	-10	0	0	0	-10
600	121.54	-4	5	-13	-263	-22	-7	5	1	2	-5	-10	-8	-13	-12	-9
734	150.99	-15	-13	-25	-272.5	-32	-11	0	-10	-13	-15	-17	-22	00	-15	-15
738	170.36															
746	170.47	-17.5	-15	-27.5	-275	-35	-12.5	-2.5	-10	-15	-15	-15	-20	-17.5	-17.5	-17.5
746	172.30															
765	172.43		-17.5	-45	-287.5	-42.5	-20	-5	-12.5	-20	-20	-15	-22.5	-20	-20	-15
782	177.40			-110	-332.5			-10	-20	-25	-25	-17.5	-22.5	-22.5	-20	-15
784	179.41			-77.5	-352.5	-80		-10	-22.5	-27.5	-27.5	-27.5	-22.5	-22.5	-22.5	-15
786	179.69				-382.5	-90		-10	-25	-30	-25	-27.5	-22.5	-22.5	-22.5	-15
786	179.83															
788	179.88			-247.5	-385	-112.5			-25	-32.5	-30	-22.5	-22.5	-22.5	-22.5	-15
788	180.00															
790	180.02					-132.5			-25	-32.5	-32.5	-25	-22.5	-22.5	-22.5	-15
790	180.19															
790	180.24					-150			-72	-42	-35	-25	-20	-18	-23	-15
791	180.73					-162			-35	-35	-36	-25	-25	-25	-18	-21
791	180.83															
791	180.88			-517		-229				-57	-55	-29	-25	-25	-22	-17
793	184.42									-56	-53	-27	-28	-25	-24	-16
792	184.54									-55	-58	-30	-25	-25	-60	-22.5
792	185.69									-57.5	-58	-30	-25	-27.5	-110	-20
793	185.90									-59	-54	-32	-27	-27	-25	-21
793	186.33									-69	-55	-31	-30	-25	-25	-18
793	186.49															
793	186.67															
795	186.79										-65	-35	-35	-30	-25	-22.5
795	187.32										-65	-37.5	-40	-27.5	-25	-25
795	187.50															
796	187.65										-61	-33	-29	-32	-23	-19
796	187.73															
797	187.85										-65	-40	-25	-19	-15	-18
797	188.27															
798	188.31															
799	188.53											-40	-30	-26	-15	-22
800	188.67															
800	188.79													-31	-27.5	-22.5
803	189.00													-25	-27.5	-22.5
805	190.23													-30	-27.5	-22.5
806	190.38															
807	190.43													-33	-23	-15
807	190.54															
809	190.58														-25	-25
811	191.21														-24	-22
812	191.40														-25	-24
812	191.42														-27.5	-22.5
812	191.47															
814	191.54															
814	192.05															
814	192.19														-33	-25
815	192.22														-37.5	-25
817	192.25															
818	192.42															-20

TEST SITE NO.2, PHALEN MINE
LOW SIDE STEEL SETS

(Raw datas)

Face @ Support	Bay Number	Mech. Strain Gage Web 781	Mech. Strain Gage Flange 781	Mech. Strain Gage Web 786	Mech. Strain Gage Flange 786	Mech. Strain Gage Web 791	Mech. Strain Gage Flange 791	Mech. Strain Gage Web 796	Mech. Strain Gage Flange 796	Mech. Strain Gage Web 800	Mech. Strain Gage Flange 800	Mech. Strain Gage Web 806	Mech. Strain Gage Flange 806	Mech. Strain Gage Web 810	Mech. Strain Gage Flange 810	Mech. Strain Gage Web 814	Mech. Strain Gage Flange 814	Mech. Strain Gage Web 818	Mech. Strain Gage Flange 818	Mech. Strain Gage Web 822	Mech. Strain Gage Flange 822	Mech. Strain Gage Web 828	Mech. Strain Gage Flange 828	Mech. Strain Gage Web 832	Mech. Strain Gage Flange 832	Mech. Strain Gage Web 836	Mech. Strain Gage Flange 836	Mech. Strain Gage Web 840	Mech. Strain Gage Flange 840	Mech. Strain Gage Web 844	Mech. Strain Gage Flange 844	Calibration	Temp. (celsius)
304	59.38											615	1045	344	1403	470	530	10	958	1001	1490											1232	12
448	92.45											661	1084	421	1449	516	582	51	1000	1040	1510											1247	14.5
460	94.46	1051	2311	1821	1721	2474	1072	2540	1930	1059	2473	672	1097	390	1452	520	588	70	1009	1054	1537	1235	1920	1999	2060	2211	2179		1935	2619	1746	1246	14.5
485	100.31	1057	2319	1831	1736	2503	1081	2605	1927	1053	2466	608	1084	385	1441	551	580	105	1067	1046	1544	1318	1819	1960	2063	2181	2051	2666	1890	2586	1741	1270	14.5
490	102.36	1045	2309	1819	1717	2469	1066	2467	1856	1065	2486	547	1101	283	1459	514	581	60	1023	1063	1510	1300	1790	1936	2041	2179	2059	2670	1912	2575	1735	1263	15.25
533	110.49																															1261	11
533	114.36	1054	2324	1844	1744	2492	1088	2575	1960	1062	2448	650	1094	1088	1448	502	551	2213	1004	1030	1510	1331	1814	1971	2065	2206	2095	2682	1935	2601	1742	1290	16.75
561	121.54	1026	2286	1796	1700	2456	1050	2370	1066	1027	2441	619	1060	1086	1422	471	541	2182	978	1023	1498	1299	1791	1728	2042	2176	2065	2676	1885	2577	1744	1234	15.5
680	150.99	1150	1016	1133	1054	656	1104	562	1212	1159	637		1542	1550	1813			1435	2477	2514	1072	1712	1124	1325	1321	1424	1319	725	1292	737	1006	1640	16.5
734	170.36	1236	1500	1212	1133	732	1264	630	1275	1244	599		1500	1510	1070			1411	1545	2501	1947	1795	1193	1235	1391			725	1285	734	1004	1663	18.75
734	170.47																															1277	18.5
746	172.38	1431	1700	1411	1324	933	1463	843	1487	1444	914		1821	1047	1105			1455	2509	2532	1083	1052	1154	1350	1343			851	1320	771	1121	1005	18.5
746	172.43																															1065	18.5
765	177.40	1551	206	1672	1763	162	1632	252	1609	1152	182		1176	1245	1002			1375	1345	1299	1943	1094	1606	1593	1186	380	1551	986	1622	75	1623	1153	17.75
782	179.41			1675	1773			245	1624	1654	195		1279	1251	1904			1378	1354	1299	1952	1093	1606	1592	1498	383	1506	994	1627	76	1622	1143	18.5
784	179.69			1675	1786			236	1623	1662	215		1290	1239	1005			1377	1341	1297	1935	1074	1607	1581	1488	386	1493	985	1617	64	1613	1140	19.75
786	179.83							236	1632	1646	193		1285	1242	1008			1371	1353	1296	1944	1077	1604					979	1617	64	1620	1130	20
786	179.88																															1239	12
788	180.00									1656	203		1291	1239	1008			1374	1355	1292	1944	1083	1582	1504	1480			981	1613	64	1712	1130	19.75
788	180.02																																
790	180.19									1658	203		209	1262	1043			1389	1373	1312	1965	1102	1703	1602	1511			977	1614	65	1614	1130	20
790	180.24																																
790	180.73									1727	379		465	1418	1985			1545	1923	1462	1927	1105	1675					984		1972	1718	1132	19
791	180.83									1409	1837	1461		1296	1412			1517	1560	1139	1462							1920		1032		1123	18
791	180.88																																
791	184.42									1003	377		1458	1373	1140			1519	1409	1424	2003							1130	1764	213	1065	1273	17.5
793	184.54									1010	340		1466	1375	1145			1525	1482	1430	2006	1227	1030	1634	1631			1082	1723	154	1050	1270	17
792	185.69												1263	1256	1007			1367	1347	1289	1947	1082	1670	1577	1487	372	409	973	1615	62	1614	1132	16.5
792	185.90												1263	1236	1006			1367	1346	1288	1945	1081	1677	1570	1485	372	491	973	1612	62	1616	1137	18.5
795	186.33												1265	1237	1007			1366	1342	1285	1953	1079	1682	1577	1490			976	1617	62	1617	1133	18
793	186.49												1263	1234	1014			1369	1338	1288	1955	1084	1693			379	411	992	1634	88	1634	1138	17
793	186.67																																
793	186.79																															1442	12
795	187.32												1271	1240	1013			1369	1345	1291	1953	1083	1683	1504	1494	374	494	976	1616	70	1717	1132	17
795	187.50												1263	1242	1010			1373	1347	1290	1953	1080	1682	1505	1489	375	494	976	1616	66	1718	1134	17
795	187.65																																
796	187.73												1265	1241	1008			1357	1345	1289	1952	1085	1683	1577	1490	376	502	980	1610	70	1720	1133	17.5
796	187.85																															1390	11.3
797	188.27												1253	1231	986			1366	1322	1285	1954	1077	1682	1577	1485	377	495	1979	1616	65	1724	1132	18.25
797	188.31																															1397	11.8
798	188.53																															1394	11.5
799	188.67												1270	1230	1011			1366	1339	1274	1955	1083	1604	1585	1495	1376	1481	983	1621	69	1727	1146	18.5
800	188.79												1275	1240	1021			1375	1341	1285		1083	1690	1585	1500		1465	985	1628	75	1730	1130	19.5
800	189.60									1637	1134		1277	1245	1032			1374	1354	1293	1960	1090	1689	1589	1496	1379	1599	981	1624	74	1723	1134	16.5
803	190.23												1312	1245	1030			1373	1355	1289	1970	1087	1690	1591	1495	1377	1621	980	1620	74	1722	1133	17
805	190.38												1315	1240	1029			1373	1357	1289	1973	1084	1689	1593	1494	1376	1596	982	1620	1074	1722	1137	17
806	190.43																															1657	12
807	190.54													1236	1032			1375	1363	1294	1975	1081	1685	1578	1499	583	396	380	1602	981	1721	1133	16.75
807	190.58																																
809	191.21																	1377	1364	1291	1977	1088	1680	1590	1497	1380	1505	994	1637	1076	1734	1144	18.5
811	191.08																																
812	191.42																																
812	191.47																																
812	191.54																																
814	192.05																	1056	2044	1968	1655	1750	1374	1264	1176	1056	1179	660	1297	745	1400	798	16.75
814	192.19																																
814	192.22																																
815	192.25																																
817	192.42																															790	19
818	192.50																									1055	1186	663	1305	746	1409	799	18.75
818	192.56																									1056	1184	660	1300	742	1410	1667	12
820	193.06																									1055	1183	663	1300	751	1414	797	18.25
818	193.08																																
823	193.21																									[illegible]	1187	660	[illegible]	[illegible]	[illegible]	[illegible]	20
[illegible]	[illegible]																									[illegible]	1190	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TEST SITE NO.2, PHALEN MINE
HIGH SIDE STEEL SETS

Face # Support	Day Number	Mech. Strain gage Web 781	Mech. Strain gage Flange 781	Mech. Strain gage Web 786	Mech. Strain gage Flange 786	Mech. Strain gage Web 791	Mech. Strain gage Flange 791	Mech. Strain gage Web 796	Mech. Strain gage Flange 796	Mech. Strain gage Web 800	Mech. Strain gage Flange 800	Mech. Strain gage Web 804	Mech. Strain gage Flange 804	Mech. Strain gage Web 810	Mech. Strain gage Flange 810	Mech. Strain gage Web 814	Mech. Strain gage Flange 814
304	59.38											973	1303	752	1367	909	1226
448	92.45											1003	1335	1785	1397	1840	1259
460	94.46											1094	1325	1786	1389	1831	1252
485	100.31	1519	1823	1497	1835	1772	2131	1282	2068	1819	1925	1084	1213	793	1387	681	1254
498	102.36	1513	1817	1500	1829	1777	2178	1292	2082	1821	1984	911	1342	791	1404	848	1261
533	110.49																
533	114.36	1516	1827	1484	1822	1757	2176	1271	2057	1804	1971	1003	1343	791	1409	821	1250
561	121.54	1483	1795	1470	1800	1743	2158	1259	2047	1790	1935	972	1309	755	1371	1008	1229
608	130.99	1865	1117	1861	1137	1094	1046	1691		1229	1250	2487	1724	2434	1771	1436	1666
734	170.36	1963	1204	1938	1215	1177	1586	1765		1206	1326	2660	1798	2540	1853	1550	1735
734	170.47																
746	172.38																
746	172.43																
765	177.40	1933		1948	1675	1710	1413	1114		1679	1561	1334	1086	2430	1035	2429	1151
782	179.41			1951	1705	1717	1418	1111		1683	1566	1324	1086	2430	1024	2430	1139
784	179.69			1946	1714	1719	1424	1115		1684	1561	1333	1085	2429	1039	2431	1145
786	179.83					1719	1434	1110		1678	1562	1326	1089	2430	1032	2430	1148
786	179.88																
788	180.00					1725	1437	1110		1679	1561	1330	1084	2436	1042	2434	1151
788	180.02																
790	180.19					1725	1433	1110		1679	1560	1330	1080	2435	1043	2434	1151
790	180.24																
790	180.73					1522	1806		278	1626	1852	1265	1406	2116	1519	2219	1517
791	180.83					1814	1128	1502	808		1252	1610	1729	2234	1476	2289	1486
791	180.88																
791	184.42					1779	1494	1136		1611	1581	1435	1218	2583	1175	2592	1272
793	184.54							1254		1828	1704	1468	1231	2599	1187	2598	1285
792	185.69							1110		1657	1538	1323	1078	2430	1029	2433	1132
792	185.90							1110		1656	1539	1323	1078	2430	1030	2432	1131
793	186.33							1099		1655	1535	1317	1075	2429	1024	2429	1129
793	186.49							1099		1661	1536	1314	1077	2429	1033	2428	1133
793	186.67																
793	186.79																
795	187.32							1104				1322	1078	2432	1031	2430	1125
795	187.50								100			1325	1076	2429	1033	2431	1133
795	187.65																
796	187.73							1098				1325	1075	2429	1029	2432	1130
796	187.85																
797	188.27							1085		1651	1524	1311	1076	2427	1027	2422	1129
797	188.31																
798	188.53																
799	188.67									1649	1518	1320	1073	2423	1031	2425	1130
800	188.79									1642	1508	1312	1079	2427	1032	2425	1142
800	189.00									1661	1520	1326	1079	2427	1036		
803	190.23											1322	1072	2424	1033	2423	1133
805	190.38											1323	1075	2422	1032	2420	1135
806	190.43																
807	190.54													2424	1035	2426	1135
807	190.58																
809	191.21													2425	1035	2424	1139
811	191.40																
812	191.42																
812	191.47																
812	191.54																
814	192.05															2074	1815
814	192.19																
814	192.22																
815	192.25																
817	192.42																
818	192.50																
818	192.56																
820	193.06																
818	193.08																
823	193.21																
824	193.33																
824	193.38																
824	193.41																
826	193.50																
826	193.57																
826	194.05																
827	194.08																
828	194.22																
829	194.25																
829	194.38																
829	194.42																
830	194.48																
832	197.00																
833	197.08																
833	197.16																
833	197.77																
833	197.88																
833	197.92																
833	198.00																
836	198.10																
836	198.11																
837	198.19																
837	198.69																
838	198.79																
839	198.90																
839	199.05																
839	199.15																
840	199.25																
840	199.67																
841	199.80																
842	199.80																
842	[illegible]																

(Raw datas)

TEST SITE NO.2, PHALEN MINE
HIGH SIDE STEEL SETS

Mech. Strain gage Web 818	Mech. Strain gage Flange 818	Mech. Strain gage Web 822	Mech. Strain gage Flange 822	Mech. Strain gage Web 828	Mech. Strain gage Flange 828	Mech. Strain gage Web 832	Mech. Strain gage Flange 832	Mech. Strain gage Web 836	Mech. Strain gage Flange 836	Mech. Strain gage Web 840	Mech. Strain gage Flange 840	Mech. Strain gage Web 844	Mech. Strain gage Flange 844	Calibration	Temperature (celsius)
1577	1460	1180	963											1232	12
1613	1499	1224	995											1247	14.5
1608	1494	1223	1000											1246	14.5
1604	1491	1221	989	1497	1446	1333	1705	1303	1681	1821	1741	1730	1610	1270	14.5
1621	1501	1236	1009	1497	1458	1342	1724	1311	1691	1911	1754	1804	1626	1263	15.25
														1261	
1590	1404	1229	1001	1426	1420	1315	1675	1332	1676	1931	1750	1802	1605	1244	14.75
1579	1473	1196	972	1454	1418	1308	1612	1274	1660	1908	1719	1766	1570	1234	15.5
1950	1852	1645	2477	1844	1811	1732	1973	1704	1028	1333	1073	1117	1942	1668	16.5
1946	1941	1730	2552	1843	1806	1730	1975	1724	933	1351	1082	1132	1931	1663	18.75
														1865	18.5
														1865	18.5
1835	1937	1164	1341	1960	1992	1980	1816	1107	1782	1577	1723	1680	1862	1153	17.75
1835	1933	1156	1333	1947	1989	1969	1815	1100	1771	1557	1723	1671	1847	1143	18.5
1836	1939	1154	1333	1949	1996	1072	1820	1096	1771	1552	1721	1685	1855	1140	19.75
1839	1941	1159	1334	1945	1987	1971	1818	1100	1774	1549	1745	1689	1852	1138	20
1837	1944	1159	1340	1947	1997	1072	1816	1102	1775	1564	1724	1690	1854	1138	19.75
1838	1946	1158	1340	1947	1997	1070	1816	1104	1778	1562	1723	1690	1852	1138	20
1837	1942	1414	1341	1984	1950	1912	1165	1865	1125	1825	1642	1972	1876	1132	19
1098	1914	1200	1452	1128	1195	1982	1201	1925	1325	1862	1681	1911	1835	1123	18
2093	2084	1293	1466	1292	1925	1205	1987	1230	1928	1695	1869	1736	1916	1273	17.5
2014	2082	1295	1477	2088	2151	1217	1994	1238	1943	1601	1881	1849	2031	1270	17
1833	1938	1153	1336	1945	1998	1971	1815	1094	1772	1557	1723	1695	1846	1132	16.5
1832	1938	1153	1336	1946	1997	1971	1814	1094	1772	1557	1723	1695	1846	1137	18.5
1829	1933	1148	1333	1944	1992	2066	1808	1092	1766	1553	1614	1685	1844	1133	18
1831	1937	1154	1331	1947	1990	2071	1814	1091	1765	1561	1619	1691	1844	1138	17
1833	1935	1155	1333	1954	1999	2069	1813	1098	1770	1662	1723	1692	1851	1132	17
1829	1934	1158	1335	1947	1998	2068	1813	1098	1768	1658	1723	1694	1850	1134	17
1826	1932	1150	1334	1941	1994	2067	1808	1096	1768	1660	1721	1684	1847	1133	17.5
1822	1932	1145	1326	1945	1981	2064	1807	1088	1764	1657	1716	1656	1842	1132	18.25
1825	1934	1149	1328	1944	1981	2063	1807	1087	1764	1673	1725	1686	1849	1146	18.5
1831	1947	1155	1335	1953	1998	2074	1814	1085	1774	1673	1732	1695	1864	1158	19.5
1836	1940	1157	1346	1952	1998	2073	1815	1098	1774	1666	1738	1699	1867	1134	16.5
1829	1934	1153	1337	1945	1996	2066	1805	1095	1766	1664	1721	1691	1846	1133	17
1830	1936	1155	1342	1955	2010	2075	1716	1103	1779	1668	1728	1705	1854	1137	17
1828	1937	1155	1338	1946	1991	2068	1712	1095	1768	1668	1723	1695	1845	1133	16.75
1833	1941	1159	1347	1946	1992	2073	1710	1095	1767	1667	1725	1691	1852	1144	18.5
1516	1610	1824	2025	1619	1665	1733	1493	1764	1452	1355	1413	1385	1532	790	16.75
1523	1616	1825	2026	1617	1661	1734	1490	1759	1450	1353	1406	1386	1530		
1518	1623	1826	2023	1617	1659	1735	1491	1759	1449	1340	1411	1367	1520	790	19
														799	18.75
		1816	2014	1616	1673	1734	1487	1751	1448	1338	1406	1367	1518		
														797	18.25
		1812	1970	1617	1673	1741	1494	1761	1461	1354	1420	1389	1539	805	20
				1617	1679	1736	1488	1758	1447	1349	1417	1377	1532	790	19
				1615	1682	1736	1485	1659	1449	1348	1419	1381	1529	796	19.5
				1511	1682	1733	1484	1755	1446	1343	1418	1380	1525	797	20
				1610	1678	1736	1489	1740	1445	1344	1417	1421	1527	790	17.75
				1611	1675	1737	1485	1758	1443	1344	1421	1422	1530	797	19
				1607	1674	1738	1475	1757	1443	1345	1422	1420	1528	798	19.5
				1605	1594	1739	1464	1754	1439	1348	1421	1418	1519	794	18.5
						1745	1470	1734	1443	1344	1420	1420	1524	800	18.5
								1738	1429	1339	1419	1417	1523	794	17.5
								1752	1438	1340	1417	1416	1524	796	17.5
								1726	1434	1342	1415	1409	1518	793	17
								1753	1432	1344	1419	1419	1519	796	17.5
								1750	1433	1342	1421	1422	1515		
								1752	1433	1340	1420	1423	1517		
								1759	1425	1338	1422	1422	1530	797	19
								1760	1431	1353	1427	1424	1533	796	20
								1761	1433	1354	1428	1424	1533	796	19.75
								1756	1438	1351	1422	1420	1532	797	19.5
								1756	1441	1353	1422	1426	1534	798	19.5
								1746	1446	1355	1422	1427	1534	798	19.75
								1752	1440	1355	1425	1426	1536	797	19.5
								1752	1442	1355	1426	1424	1532	800	19.5
								1755	1441	1358	1425	1425	1534	798	20
								1760	1417	1357	1417	1427	1540	803	20
								1757	1417	1359	1413	1425	1541	804	20
								1761	1418	1357	1415	1426	1540	803	20
								1761	1428	1354	1380	1424	1532	799	19.75
										1353	1405	1422	1526	799	21
										1353	1403	1425	1532	799	21.25

(Raw datas)

TEST SITE NO.2, PHALEN MINE

LOW SIDE STEEL SETS (Corrected for calibration value and temperature)

Face # Support	Dev Number	Mech. Strain gage Web 781	Mech. Strain gage Flange 781	Mech. Strain gage Web 796	Mech. Strain gage Flange 796	Mech. Strain gage Web 800	Mech. Strain gage Flange 800	Mech. Strain gage Web 806	Mech. Strain gage Flange 806	Mech. Strain gage Web 810	Mech. Strain gage Flange 810	Mech. Strain gage Web 818	Mech. Strain gage Flange 818	Mech. Strain gage Web 822	Mech. Strain gage Flange 822	Mech. Strain gage Web 828	Mech. Strain gage Flange 828	Mech. Strain gage Web 832	Mech. Strain gage Flange 832	Mech. Strain gage Web 836	Mech. Strain gage Flange 836	Mech. Strain gage Web 840	Mech. Strain gage Flange 840	Mech. Strain gage Web 844	Mech. Strain gage Flange 844	Calibration	Temp. (celsius)	Difference with calibration	Difference with temperature
784	179.69			236.0	1623.0	1662.0	215.0		1290.0	1229.0	1005.0	1377.0	1341.0	1297.0	1935.0	1074.0	1687.0	1581.0	1488.0	1386.0	1493.0	985.0	1617.0	64.0	1613.0	1140	19.75	0	0
786	179.85			237.7	1633.7	1647.7	194.7		1286.7	1263.7	1009.7	1372.7	1354.7	1297.7	1945.7	1078.7	1685.7					980.7	1618.7	65.7	1621.7	1138	20	-2	0.25
786	179.88																												
788	180.00					1650.0	205.0		1293.0	1241.0	1010.0	1376.0	1357.0	1294.0	1946.0	1085.0	1684.0	1586.0	1490.0			983.0	1615.0	66.0	1614.0	1138	19.75	-2	0
788	180.02																												
790	180.19					1659.7	204.7		1290.7	1263.7	1044.7	1390.7	1374.7	1313.7	1966.7	1103.7	1704.7	1603.7	1512.7			978.7	1615.7	66.7	1615.7	1138	20	-2	0.25
790	180.24																												
790	180.73																									1132	19	-8	-0.75
791	180.85																									1123	18	-17	-1.75
791	180.88																												
791	184.42																									1273	17.5	133	-2.25
793	184.54																									1270	17	130	-2.75
792	185.69								1274.6	1247.6	1018.6	1378.6	1358.6	1300.6	1958.6	1093.6	1689.6	1580.6	1498.6	1383.6	1500.6	984.6	1626.6	73.6	1625.6	1132	16.5	-8	-3.25
792	185.90								1267.4	1240.4	1010.4	1371.4	1350.4	1292.4	1949.4	1085.4	1681.4	1574.4	1489.4	1376.4	1495.4	977.4	1616.4	66.4	1620.4	1137	18.5	-3	-1.25
793	186.33								1273.9	1245.9	1015.9	1374.9	1350.9	1293.9	1961.9	1087.9	1690.9	1585.9	1498.9			984.9	1625.9	70.9	1625.9	1133	18	-7	-1.75
793	186.49								1268.0	1239.0	1019.0	1374.0	1343.0	1293.0	1960.0	1089.0	1698.0			1384.0	1416.0	997.0	1639.0	93.0	1639.0	1138	17	-2	-2.75
793	186.67																												
793	186.79																												
795	187.32								1282.0	1251.0	1024.0	1380.0	1356.0	1302.0	1964.0	1094.0	1694.0	1595.0	1505.0	1385.0	1505.0	987.0	1627.0	81.0	1628.0	1132	17	-8	-2.75
795	187.50								1272.0	1251.0	1019.0	1382.0	1356.0	1299.0	1962.0	1089.0	1691.0	1594.0	1498.0	1380.0	1503.0	985.0	1625.0	75.0	1627.0	1134	17	-6	-2.75
795	187.65																												
796	187.73								1274.5	1250.5	1017.5	1366.5	1354.5	1298.5	1961.5	1094.5	1692.5	1586.5	1499.5	1385.5	1511.5	989.5	1627.5	79.5	1629.5	1133	17.5	-7	-2.25
796	187.85																												
797	188.27								1262.7	1240.7	1015.7	1375.7	1331.7	1294.7	1963.7	1086.7	1691.7	1586.7	1494.7	1386.7	1504.7	980.7	1625.7	74.7	1633.7	1132	18.25	-8	-1.5
797	188.31																												
798	188.53																												
799	188.67																									1146	18.5	6	-1.25
800	188.79								1277.3	1242.3	1023.3	1377.3	1343.3	1287.3		1085.3	1692.3	1587.3	1502.3		1467.3	987.3	1630.3	77.3	1632.3	1138	19.5	-2	-0.25
800	189.00					1646.6			1286.6	1254.6	1041.6	1383.6	1363.6	1302.6	1977.6	1099.6	1698.6	1598.6	1505.6	1388.6	1508.6	990.6	1633.6	83.6	1632.6	1134	16.5	-6	-3.25
803	190.23								1322.0	1255.0	1040.0	1383.0	1365.0	1299.0	1980.0	1097.0	1700.0	1601.0	1505.0	1387.0		990.0	1630.0	80.0	1632.0	1133	17	-7	-2.75
805	190.30								1321.0	1246.0	1035.0	1379.0	1363.0	1295.0	1979.0	1090.0	1695.0	1599.0	1500.0	1382.0	1502.0	988.0	1626.0	80.0	1628.0	1137	17	-3	-2.75
806	190.43																												
807	190.54									1246.3	1042.3	1385.3	1373.3	1304.3	1985.3	1091.3	1695.3	1588.3	1509.3				1612.3		1631.3	1133	16.75	-7	-3
807	190.58																												
809	191.21											1374.4	1361.4	1288.4	1974.4	1085.4	1685.4	1587.4	1494.4	1385.4	1502.4	991.4	1634.4	73.4	1631.4	1144	18.5	4	-1.25
811	191.40																												
812	191.42																												
812	191.47																												
812	191.54																												
814	192.05											1379.3	1363.3	1295.3	1979.3	1086.3	1695.3	1599.3	1500.3	1382.3	1502.3	988.3	1626.3	80.3	1628.3	798	16.75	-342	-3
814	192.19																												
814	192.22																												
815	192.25																												
817	192.42																			1378.0	1506.0	988.0	1631.0	78.0	1634.0	798	19	-342	-0.75
818	192.50																			1379.1	1504.1	985.1	1626.1	74.1	1639.1	799	18.75	-341	-1
818	192.56																												
820	193.06																				1380.7	1505.7	990.7	1636.7	85.7	1641.7	797	18.25	-343	-1.5
818	193.08																												
825	193.21																			1370.7	1495.7	977.7	1623.7	75.7	1632.7	805	20	-335	0.25
																				1389.0	1510.0	990.0	1633.0	85.0	1639.0	798	19	-342	-0.75

(Corrected datas)

TEST SITE NO.2. PHALEN MINE
HIGH SIDE STEEL SETS (Corrected for calibration value and temperature)

Face # Support	Day Number	Mech. Strain gage Web 791	Mech. Strain gage Flange 791	Mech. Strain gage Web 796	Mech. Strain gage Flange 796	Mech. Strain gage Web 800	Mech. Strain gage Flange 800	Mech. Strain gage Web 806	Mech. Strain gage Flange 806	Mech. Strain gage Web 810	Mech. Strain gage Flange 810	Mech. Strain gage Web 814	Mech. Strain gage Flange 814	Mech. Strain gage Web 818	Mech. Strain gage Flange 818	Mech. Strain gage Web 822	Mech. Strain gage Flange 822
788	179.69	1719.0	1424.0	1115.0		1684.0	1561.0	1323.0	1085.0	2429.0	1039.0	2431.0	1142.0	1836.0	1939.0	1154.0	1332.0
788	179.82	1720.7	1425.7	1111.7		1679.7	1562.7	1327.7	1090.7	2431.7	1032.7	2431.7	1149.7	1844.7	1942.7	1166.7	1332.7
788	179.86																
788	180.00	1727.0	1439.6	1112.0		1681.0	1563.0	1332.0	1086.0	2436.0	1044.0	2436.0	1152.0	1839.0	1946.0	1161.0	1342.0
788	180.12																
790	180.19	1726.7	1434.7	1111.7		1680.7	1561.7	1331.7	1081.7	2436.7	1044.7	2432.7	1152.7	1829.7	1947.7	1159.7	1341.7
790	180.24																
790	180.73																
791	180.83																
791	180.88																
791	184.42																
793	184.56																
792	185.69			1121.6		1668.6	1549.6	1334.6	1089.6	2441.6	1040.6	2444.6	1143.6	1844.6	1949.6	1164.6	1347.6
792	185.96			1114.4		1666.4	1543.4	1327.4	1082.4	2434.4	1034.4	2436.4	1135.4	1836.4	1942.4	1157.4	1340.4
793	186.33			1107.9		1663.9	1543.9	1325.9	1083.9	2427.9	1042.9	2427.9	1137.9	1837.9	1941.9	1156.9	1341.9
793	186.49			1104.0		1666.0	1541.0	1319.0	1082.0	2434.0	1038.6	2433.0	1138.0	1836.0	1942.0	1155.0	1336.0
793	186.67																
793	186.79																
795	187.32			1115.6				1333.0	1089.0	2442.0	1042.0	2441.0	1146.0	1844.0	1946.0	1166.0	1346.0
795	187.50							1334.0	1085.0	2436.0	1042.0	2446.0	1142.0	1838.0	1942.0	1167.0	1344.0
795	187.65																
796	187.73			1107.5				1334.5	1084.5	2438.5	1038.5	2441.5	1139.5	1835.5	1941.5	1159.5	1342.5
796	187.85																
797	188.27			1094.7		1660.7	1533.7	1326.7	1085.7	2436.7	1036.7	2431.7	1136.7	1831.7	1941.7	1154.7	1335.7
797	188.31																
798	188.53																
799	188.67					1644.4	1513.4	1315.4	1068.4	2418.4	1026.4	2426.4	1122.4	1826.4	1929.4	1144.4	1322.4
800	188.79					1664.3	1516.3	1314.3	1081.3	2429.3	1034.3	2427.3	1144.3	1822.3	1948.3	1157.3	1337.3
800	189.06					1670.6	1529.6	1332.6	1088.6	2436.6	1045.6			1845.6	1948.6	1166.6	1352.6
803	190.23							1332.0	1082.0	2434.0	1042.0	2432.0	1143.0	1829.0	1944.0	1163.0	1347.0
805	190.38							1329.0	1081.0	2428.0	1038.0	2426.0	1141.0	1836.0	1942.0	1161.0	1348.0
806	190.43																
807	190.54									2434.3	1045.3	2436.3	1145.3	1838.3	1947.3	1165.3	1346.3
807	190.58																
809	191.21									2422.4	1032.4	2421.4	1136.4	1830.4	1938.4	1152.4	1340.4
811	191.46																
812	191.42																
812	191.47																
812	191.54																
814	192.05											2426.3	1141.3	1836.3	1942.3	1161.3	1346.3
814	192.19																
814	192.22																
815	192.25																
817	192.42													1840.8	1945.8	1159.8	1346.8
818	192.50													1835.1	1952.1	1160.1	1342.1
818	192.56																
820	193.21															1152.7	1336.7
818	193.06																
823	193.21															1126.7	1282.7
824	193.33																
824	193.38																
824	193.41																
826	193.50																
826	193.57																
826	194.05																
827	194.08																
828	194.22																
829	194.25																
829	194.38																
829	194.42																
830	194.48																
832	197.00																
833	197.08																
833	197.16																
833	197.77																
833	197.88																
833	197.92																
833	198.00																
836	198.10																
836	198.11																
837	198.19																
837	198.69																
838	198.79																
839	198.90																
839	199.05																
839	199.15																
840	199.25																
840	199.67																
841	199.86																
842	199.89																
842	199.99																
842	200.08																
844	200.11																
844	200.16																
844	200.21																

(Corrected datas)

TEST SITE NO.2, PHALEN MINE

HIGH SIDE STEEL SETS (Corrected for calibration value and temperature)

Mech. Strain Gage Web 828	Mech. Strain Gage Flange 828	Mech. Strain Gage Web 832	Mech. Strain Gage Flange 832	Mech. Strain Gage Web 836	Mech. Strain Gage Flange 836	Mech. Strain Gage Web 840	Mech. Strain Gage Flange 840	Mech. Strain Gage Web 844	Mech. Strain Gage Flange 844	Calibration	Temp. (Celsius)	Difference with calibration	Difference with Temperature
1947.0	1996.0	1972.0	1820.0	1096.0	1771.0	1552.0	1721.0	1682.0	1855.0	1140	19.75	0	0
1946.7	1988.7	1970.7	1819.7	1101.7	1775.7	1559.7	1746.7	1690.7	1852.7	1138	20	-2	0.25
1947.0	1995.0	1974.0	1818.0	1104.0	1777.0	1566.0	1726.0	1692.0	1856.0	1138	19.75	-2	0
1946.7	1998.7	1971.7	1817.7	1105.7	1779.7	1563.7	1724.7	1691.7	1852.7	1138	20	-2	0.25
									1684.8	1132	19	-8	-0.75
									1852.9	1123	18	-17	-1.75
										1272	17.5	132	-2.25
										1270	17	130	-2.75
1956.6	2009.6	1982.6	1826.6	1105.6	1783.6	1568.6	1734.6	1706.6	1857.6	1132	16.5	-8	-3.25
1950.4	2011.4	1975.4	1810.4	1090.4	1776.4	1561.4	1727.4	1699.4	1851.4	1137	18.5	-3	-1.25
1952.9	2066.9	1974.9	1816.9	1100.9	1774.9	1561.9		1693.9	1852.9	1133	18	-7	-1.75
1952.0	1995.0	1976.0	1819.0	1096.0	1770.0	1566.0		1695.0	1849.0	1138	17	-2	-2.75
1962.0	2010.0	1986.0	1824.0	1105.0	1781.0	1573.0	1724.0	1702.0	1862.0	1132	17	-8	-2.75
1956.0	2017.0	1977.0	1822.0	1107.0	1777.0	1567.0	1722.0	1703.0	1858.0	1134	17	-6	-2.75
1951.5	2012.5	1976.5	1817.5	1105.5	1777.5	1569.5	1730.5	1697.5	1856.5	1133	17.5	-7	-2.25
1954.7	1996.7	1973.7	1816.7	1097.7	1773.7	1566.7	1725.7	1665.7	1851.7	1132	18.25	-8	-1.5
1939.4	1976.4	1958.4	1802.4	1082.4	1759.4	1560.4	1720.4	1681.4	1844.4	1146	18.5	6	-1.25
1955.3	2006.3	1976.3	1816.3	1107.3	1776.3	1575.3	1724.3	1697.3	1866.3	1138	19.5	-2	-0.25
1961.6	2017.6	1982.6	1824.6	1107.6	1782.6	1575.6	1729.6	1708.6	1876.6	1134	16.5	-6	-3.25
1955.0	2066.0	1976.0	1815.0	1105.0	1776.0	1574.0	1731.0	1711.0	1856.0	1133	17	-7	-2.75
1960.0	2016.0	1981.0	1822.0	1109.0	1785.0	1574.0	1734.0	1711.0	1860.0	1137	17	-3	-2.75
1956.3	2001.3	1976.3	1822.3	1105.3	1776.3	1578.3	1733.3	1705.3	1855.3	1133	16.75	-7	-3
1947.4	1989.4	1970.4	1807.4	1092.4	1764.4	1564.4	1722.4	1688.4	1849.4	1144	18.5	4	-1.25
1961.3	2016.3	1981.3	1722.3	1109.3	1785.3	1574.3	1734.3	1711.3	1860.3	798	16.75	-342	-3
1952.8	2009.8	1979.8	1716.8	1101.8	1786.8	1569.8	1724.8	1709.8	1855.8	798	19	-342	-0.75
1956.1	2007.1	1980.1	1717.1	1101.1	1779.1	1564.1	1729.1	1690.1	1845.1	799	18.75	-341	-1
1927.7	2033.7	1981.7	1715.7	1095.7	1780.7	1556.7	1726.7	1692.7	1845.7	797	18.25	-343	-1.5
1940.7	2023.7	1978.7	1712.7	1095.7	1783.7	1562.7	1736.7	1704.7	1856.7	805	20	-335	0.25
1956.8	2027.8	1981.8	1714.8	1100.8	1777.8	1565.8	1725.8	1700.8	1857.8	798	19	-342	-0.75
1956.3	2032.3	1983.3	1713.3	1103.3	1781.3	1566.3	1739.3	1716.3	1856.3	796	19.5	-344	-0.25
1951.7	2030.7	1978.7	1710.7	1097.7	1776.7	1559.7	1736.7	1703.7	1850.7	797	20	-343	0.25
1951.2	2028.2	1983.2	1717.2	1084.2	1777.2	1562.2	1737.2		1854.2	798	17.75	-342	-2
1951.8	2024.8	1987.8	1712.8	1101.8	1774.8	1561.8	1740.8		1856.8	797	19	-343	-0.75
1946.3	2022.3	1983.3	1701.3	1099.3	1773.3	1561.3	1740.3		1857.3	798	19.5	-342	-0.25
1949.4	1967.4	1989.4	1695.4	1101.4	1774.4	1569.4	1744.4		1849.4	794	18.5	-346	-1.25
		1989.4	1695.4	1095.4	1771.4	1559.4	1737.4		1848.4	800	18.5	-340	-1.25
				1098.5	1765.5	1561.5	1743.5		1856.5	794	17.5	-346	-2.25
				1098.5	1764.5	1560.5	1739.5		1853.5	796	17.5	-344	-2.25
				1076.0	1772.0	1566.0	1741.0		1851.0	793	17	-347	-2.75
				1099.5	1766.5	1564.5	1741.5		1840.5	796	17.5	-344	-2.25
					1421.0		1397.0		1498.0				
					1421.0		1396.0		1500.0				
				1102.8	1756.8	1575.8	1741.8		1856.8	797	19	-343	-0.75
				1103.7	1762.7	1570.7	1746.7		1859.7	796	20	-344	0.25
				1105.0	1765.0	1572.0	1748.0		1860.0	796	19.75	-344	0
				1099.3	1769.3	1568.3	1741.3		1858.3	797	19.5	-343	-0.25
				1098.3	1771.3	1569.3	1740.3		1859.3	798	19.5	-342	-0.25
				1088.0	1776.0	1571.0	1740.0		1859.0	798	19.75	-342	0
				1095.3	1771.3	1572.3	1744.3		1862.3	797	19.5	-343	-0.25
				1092.3	1770.3	1569.3	1742.3		1855.3	800	19.5	-340	-0.25
				1096.7	1770.7	1570.7	1742.7		1858.7	798	20	-342	0.25
				1096.7	1741.7	1567.7	1729.7		1859.7	803	20	-337	0.25
				1092.7	1746.7	1568.7	1724.7		1859.7	804	20	-336	0.25
				1097.7	1742.7	1567.7	1727.7		1859.7	803	20	-337	0.25
				1102.0	1757.0	1569.0			1856.0	799	19.75	-341	0
						1566.6	1720.6		1848.6	799	21	-341	1.25
						1566.4	1718.4		1854.4	799	21.25	-341	1.5
										800	21.25	-340	1.5
						1563.6	1717.6		1852.6	801	21	-339	1.25

(Corrected datas)

TEST SITE NO.2. PHALEN MINE
LOW SIDE AXIAL LOAD

Face @ Support	Bar Number	Support 791	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.69		0	0		0		0	0	0	0	0	0	0
786	179.83		13.524	-111.916		37.044		-32.316	7.644	37.044				13.524
786	179.88													
788	180.00			-71.736		15.68		-7.84	-23.52	86.24	39.2		15.68	15.68
788	180.02													
789	180.19			-17.836		197.844		107.604	131.124	233.044	178.164		-49.196	21.364
790	180.24													
790	180.73													
791	180.83													
791	180.88													
791	184.02													
793	184.54													
792	185.69					67.228		12.348	28.028	153.468	59.388	-19.012	-3.332	75.656
792	185.96					19.96		-44.1	-36.26	89.18	-51.94	-75.46	-59.78	18.62
793	186.33					54.292		-16.268	-24.108	109.172	38.612		-1.568	54.292
793	186.45					0.196		-27.720	-31.164	117.796		-15.484	94.276	227.556
793	186.67													
793	186.79													
795	187.32					94.276		23.716	39.396	156.996	149.956	-7.644	15.876	133.476
795	187.56					94.276		39.396	15.876	117.796	162.116	-15.484	0.196	86.436
795	187.65													
796	187.73					89.964		-82.516	11.564	160.524	82.908	-4.116	35.476	131.124
796	187.85													
797	188.27					12.936		-10.584	-18.424	98.196	88.396	5.096	26.656	83.496
797	188.31													
798	188.53													
799	188.67													
800	188.79					25.676		2.156	-76.244	88.396	49.196		17.836	160.676
801	189.06			-121.912		122.156		21.546	42.796	200.508	137.788	29.988	42.728	153.468
803	190.22					125.636		47.236	15.876	180.516	156.996	8.036	35.476	156.996
805	190.28					55.076		15.876	-15.484	125.636	141.316	-31.164	23.716	125.636
806	190.43													
807	190.54							65.072	57.232	135.632	57.232			
807	190.58													
809	191.21							-20.58	-67.62	89.18	49.98	-4.9	49.98	73.5
811	191.06													
812	191.42													
812	191.47													
812	191.54													
814	192.05							18.032	-13.328	96.432	143.472	-29.008	25.872	127.792
814	192.19													
814	192.22													
815	192.25													
817	192.42											-36.252	29.988	116.228
818	192.50											-54.096	0.784	79.184
819	192.56													
820	193.06											-41.944	44.296	169.736
818	193.08													
823	193.21											-119.756	-57.624	91.924
824	193.33											29.988	45.668	171.108
824	193.38													
824	193.41													
826	193.56													
826	193.57													
826	194.05													
827	194.08													
828	194.22													

TEST SITE NO.2. PHALEN MINE
LOW SIDE BENDING MOMENT

Face @ Support	Bar Number	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.69	0	0		0		0	0	0	0	0	0	0
786	179.83	-2.943	1.962		-3.7E-14		-5.886	-3.27	1.962			-1.962	-2.289
786	179.88												
788	180.00		1.962		-0.981		-5.559	-4.578	4.578	0.981		0	0.327
788	180.02												
789	180.19		2.616		-4.905		-6.54	-4.905	3.924	-0.654		-1.635	2.0E-14
790	180.24												
790	180.73												
791	180.83												
791	180.88												
791	184.02												
793	184.54												
792	185.69				-1.635		-5.232	-6.54	5.559	-0.981	-3.27	-3.27	-0.981
792	185.96				-1.308		-4.905	-6.213	5.559	-2.616	-3.924	-2.289	-1.635
793	186.33				-1.308		-3.924	-9.81	3.27	-1.962		-2.943	-1.962
793	186.45				-4.578		-1.635	-9.483	1.308		24.525	-3.27	0.981
793	186.67												
793	186.79												
795	187.32				-2.289		-3.924	-7.848	4.251	-0.981	-4.251	-2.616	0.654
795	187.56				-0.654		-3.27	-8.175	3.597	0.981	-3.924	-2.616	-0.981
795	187.65												
796	187.73				-0.327		-7.848	-8.175	4.905	-1.962	-6.213	-1.962	-0.327
796	187.85												
797	188.27				2.943		2.616	-16.023	2.616	-0.327	-3.597	-1.635	-3.27
797	188.31												
798	188.53												
799	188.67												
800	188.79				-4.905		-0.654		1.962	-2.616		-3.597	-1.962
801	189.07				-6.867		-5.232	-12.099	4.578	0	-4.251	-3.597	-1.0E-14
803	190.23				-6.213		-5.886	-14.061	3.27	0.981		-2.616	0.327
805	190.28				-7.521		-6.54	-15.042	2.616	1.962	-4.251	-1.962	0.327
806	190.43												
807	190.54						-7.848	-14.061	2.943	-4.578			
807	190.58												
809	191.21						-7.521	-15.696	4.251	0	-3.27	-3.597	-2.943
811	191.06												
812	191.42												
812	191.47												
812	191.54												
814	192.05						-6.54	-15.042	1.308	1.962	-4.251	-1.962	0.327
814	192.19												
814	192.22												
815	192.25												
817	192.42										-6.867	-3.597	-2.289
818	192.50										-5.886	-2.943	-5.232
819	192.56												
820	193.06										-5.886	-4.578	-2.289
818	193.08												
823	193.21										-5.886	-4.578	-2.616
824	193.33										-4.578	-3.597	-1.635

(Converted datas, as plotted on graphs, y-axis)

TEST SITE NO.2, FINLEN MINE
LOW SIDE MAXIMUM STRESS

Face # Support	Bar Number	Support 796	Support 800	Support 806	Support 810	Support 814	Support 816	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.69	0	0		0		0	0	0	0	0	0	0
786	179.83	-15.1135	-41.0040		0.742572		-46.1554	-15.2499	-2.70435				-10.9646
786	179.88												
788	180.00		-20.6946		-2.09962		-37.7203	-35.2285	-6.36172	4.086136		-4.12304	2.049352
788	180.02												
790	180.19		-21.2067		19.06365		-13.1095	3.368292	36.39671	42.70015		-23.7109	5.610772
790	180.24												
790	180.73												
791	181.03												
791	181.06												
791	184.42												
791	184.54												
792	185.69				7.360524		-29.9442	-34.1103	5.095700	9.39558	-25.7456	-21.6211	13.51962
792	185.91				-5.46201		-42.7156	-40.9516	-11.0119	-36.2561	-44.7396	-30.2435	-5.47238
792	186.33				5.98644		-29.1723	-60.5750	7.96735	-2.29197		-10.8256	1.021665
792	186.45				-20.9512		-16.5666	-60.3562	22.66239		-159.656	4.049700	53.62276
793	186.67												
792	186.75												
795	187.32				16.27717		-10.6565	-35.4265	14.32166	22.69496	-20.9707	-12.4205	30.95521
795	187.55				20.64561		-10.3637	-47.6560	8.16096	20.63304	-26.9661	-15.5443	16.50726
795	187.65												
796	187.72				21.56604		-71.4874	-40.0260	11.10045	-1.15791	-40.4977	-3.21963	29.03572
796	187.85												
797	188.27				-15.2682		-15.3700	-69.1546	9.487384	9.57536	-21.4791	-2.00643	1.214568
797	188.71												
798	188.77												
799	188.67												
804	188.79				-24.3605		-3.58194		10.00122	-3.65735		-10.1285	14.92506
804	189.46				-11.4495		-19.6346	-65.2600	23.60077	36.23824	-21.6505	-11.3241	40.36206
805	190.23				-6.37304		-24.9177	-85.0275	26.73082	25.06648		-6.22475	39.21546
805	190.26				-33.2282		-37.3143	-95.4967	16.44636	24.71918	-35.1644	-6.20962	36.96778
806	190.43												
807	190.54						-32.6737	-74.1509	17.00062	-13.9968			
807	190.55												
808	191.21						-53.1257	-117.259	-3.51006	13.14874	-22.0335	-9.67462	0.660106
811	191.40												
812	191.42												
812	191.47												
812	191.54												
814	192.05						-36.7473	-88.9717	17.06766	25.20620	-34.5974	-5.64259	31.53400
814	192.19												
814	192.22												
815	192.25												
817	192.42										-56.3585	-14.9325	16.04654
818	192.50										-51.3680	-18.4642	-12.3664
818	192.56												
820	193.09										-40.3720	-17.3929	30.11915
818	193.04												
822	193.21										-60.8366	-44.0433	7.580106
824	193.33										-21.1559	-16.0406	34.62096

(Converted datas, as plotted on graphs, y-axis)

TEST SITE NO.2. PHALEN MINE

HIGH SIDE AXIAL LOAD

Face @ Support	Day Number	Support 781	Support 786	Support 791	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.69		0	0	0	0	0	0	0	0	0	0	0	0	0	0
786	179.87			13.524	-25.676	-33.516	-41.356	21.364	5.684	37.044	52.724	-17.836	5.684	44.884	-9.996	44.884
786	179.88															
788	180.00			62.72	-23.52	-23.52	-7.84	70.56	39.2	23.52	54.88	0	15.68	62.72	109.76	54.88
788	180.02															
790	180.19			60.564	-25.676	-25.676	-9.996	60.564	37.044	29.204	44.884	-2.156	-2.156	76.244	91.924	52.724
791	180.24															
791	180.72															
791	180.82															
791	180.88															
791	184.42															
793	184.54															
792	185.69				51.548	-120.93	12.348	98.588	106.428	67.228	82.908	59.388	82.908	75.068	129.948	169.148
792	185.90				-4.9	-105.22	-44.1	42.14	42.14	2.94	26.46	10.78	26.46	18.62	73.5	112.7
793	186.33				-55.468	-157.36	-55.468	69.972	54.292	15.092	22.932	30.772	22.932	38.612	77.812	69.972
793	186.49				-86.044	-140.92	-109.56	39.396	15.876	0.196	39.396	23.716	31.556	0.196	109.956	86.436
794	186.67															
795	186.79															
795	187.32				0.196		0.196	109.956	78.596	62.916	94.276	125.636	62.916	102.116	164.836	141.316
795	187.50						8.036	70.756	70.756	15.876	102.116	55.076	39.396	86.436	117.796	141.316
795	187.65															
796	187.73				-50.996		11.564	74.284	82.124	-4.116	42.924	11.564	35.084	74.284	[illegible]	66.444
796	187.85															
797	188.27				-159.54	-103.06	-96.824	59.976	5.096	-34.104	5.096	44.296	12.936	12.936	114.856	-151.7
797	188.31															
798	188.55															
799	188.67					-310.66	-130.18	-83.3	-83.3	-122.5	-75.46	-75.46	-106.82	-106.82	128.38	-28.42
800	188.79					-154.64	-146.804	2.156	-29.204	-21.364	25.676	45.196	33.516	88.396	162.476	96.236
800	189.00					-105.22	26.188	59.388		75.068	98.588	98.588	82.908	90.748	184.828	164.828
803	190.23						-7.644	39.396	15.876	23.716	70.756	47.236	31.556	70.756	172.676	125.636
805	190.36						-31.164	-7.644	-39.004	0.196	55.076	94.276	70.756	102.116	172.676	204.036
806	190.42															
807	190.54							41.552	41.552	18.032	88.592	57.232	49.392	72.912	206.192	159.152
807	190.58															
808	191.21							-51.94	-75.46	-44.1	18.62	-44.1	-12.74	-28.42	97.02	26.46
811	191.40															
812	191.42															
812	191.47															
812	191.54															
814	192.05								-36.848	2.352	57.232	96.432	72.912	104.272	174.832	206.192
814	192.19															
814	192.22															
815	192.28															
817	192.42									37.828	45.668	61.348	61.348	45.668	177.748	194.628
818	192.50									-7.056	47.824	55.664	63.504	39.984	44.864	39.984
818	192.56															
820	193.21										-10.584	67.816	75.656	-2.744	36.456	59.976
818	193.06															
822	193.21										-119.75	-2.156	52.724	-2.156	84.084	154.644
824	193.73											61.348	77.028	37.828	108.388	124.068
824	193.38											57.036	88.396	57.036	111.916	166.796
824	193.41															
826	193.56											13.524	52.724	13.524	60.564	146.804
826	193.57															
826	194.05											17.248	87.808	-92.512	79.968	
827	194.08											22.148	92.708	45.668	77.028	
828	194.22											-21.364	88.396	25.676	72.716	
829	194.25															
829	194.30											2.94	136.22	42.14	136.22	
829	194.42															
830	194.48												136.22	-4.9	57.82	
832	197.00													19.404	74.284	
833	197.08													19.404	66.444	
833	197.16													-156.604	109.956	
833	197.77													27.244	97.804	
833	197.88															
833	197.92															
833	198.06													53.508	166.788	
836	198.10															
836	198.11													60.564	146.804	
837	198.19													70.56	156.8	
837	198.69													25.676	127.596	
838	198.79													17.836	135.436	
839	198.90													-62.72	148.96	
839	199.05													-5.684	158.956	
839	199.15													-29.204	135.436	
840	199.29													5.684	146.804	
840	199.67													5.684	123.284	
841	199.87													-25.676	131.124	
842	199.89													13.524	123.284	
842	199.99													47.04	137.28	
842	200.08														114.66	
844	200.11														112.904	
844	200.16															
844	200.21														91.14	

(Converted datas,

as plotted on graphs, y-axis)

TEST SITE NO.1. PHALEN MINE

HIGH SIDE BENDING MOMENT

Face @ Support	Day Number	Support 781	Support 786	Support 791	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.69		0	0		0	0	0	0	0	0	0	0	0	0	0
786	179.83			-3.27		-2.289	-3.597	2.616	-1.308	0.327	1.308	1.635	0.327	0.327	-0.829	2.289
786	179.88															
788	180.04			-2.289		-1.635	-0.654	1.308	-0.981	-1.308	-0.654	-0.981	1.308	0.654	2.943	1.962
788	180.02															
790	180.19			-0.981		-1.308	0.654	0.654	-0.981	-1.635	-0.981	-0.981	0.654	0.327	2.616	2.616
790	180.24															
790	180.73															
791	180.83															
791	180.88															
791	184.02															
793	184.54															
792	185.69					-1.308	-0.981	3.597	4.905	-0.654	-1.308	-1.962	1.308	-0.981	0.981	6.213
792	185.96					-1.962	-0.981	3.27	4.905	-0.981	-1.308	-1.308	1.635	-0.981	0.981	6.213
793	186.33					-0.981	-1.962	1.635	4.578	-0.327	-1.962	-0.327	1.962	0.327		5.559
792	186.49					0.654	-3.597	1.962	2.943	-0.981	0.654	1.308	1.635	0.327		5.559
793	186.67															
793	186.79															
795	187.32						-1.308	3.597	2.943	0.327	-0.327	0.654	1.308	0.981	2.616	3.597
795	187.38															
795	187.65															
796	187.73						0.654	3.27	5.232	-0.981	-1.635	-1.962	2.289	0.981	2.616	2.289
796	187.85															
797	188.27					1.308	-4.251	3.27	2.289	-2.289	-0.654	3.597	1.635	-0.327	3.27	-5.232
797	188.31															
798	188.53															
799	188.67					2.616	-0.327	0.654	2.943	-1.962	0	3.27	1.308	-0.654	5.559	2.289
800	188.79					10.137	-4.905	1.635	-0.981	-4.251	-0.327	0.654	2.616	1.962	3.27	0.327
800	189.00					5.886	-0.327	0.327		-0.327	-3.27	0.327	1.962	-0.327	1.635	0.654
803	190.27						0.654	0.327	1.308	-0.654	-1.635	-1.308	2.943	1.308	3.924	4.905
805	190.36						0	0	-0.327	-0.981	-2.616	-2.616	2.289	-0.327	2.943	6.867
806	190.42															
807	190.54							-0.327	1.635	-1.962	-1.308	0.654	1.308	0.654	4.578	6.54
807	190.58															
809	191.21							0	-0.327	-1.635	-2.943	0.327	3.597	0.981	3.597	2.943
811	191.40															
812	191.42															
812	191.47															
812	191.54															
814	192.05								-0.327	-0.981	-2.616	-2.616	34.989	-0.327	2.943	6.867
814	192.19															
814	192.22															
815	192.28															
817	192.42									-0.654	-2.616	-1.962	36.297	-1.308	4.578	7.848
818	192.50									-4.578	-1.308	-1.308	36.297	-0.981	1.308	4.905
818	192.56															
820	193.21										-1.635	-9.483	37.278	-3.27	-0.327	5.559
818	193.06															
823	193.21										11.445	-9.156	37.278	-4.251	-2.289	5.886
824	193.33											-7.848	37.605	-0.654	-0.327	4.251
824	193.36											-9.483	38.586	-0.981	-1.308	6.54
824	193.41															
826	193.50											-10.791	37.932	-1.308	-2.616	7.521
826	193.57															
826	194.05											-9.81	37.278	-5.886	-1.962	
827	194.08											-8.502	38.913	0.654	-3.27	
828	194.22											-9.483	42.51	0.327	-3.27	
829	194.25															
829	194.38											16.023	46.434	0.654	-1.962	
829	194.42															
830	194.48												46.434	-0.327	-2.943	
832	197.00													2.616	-4.251	
833	197.08													2.943	-3.27	
833	197.16													-6.867	-1.962	
833	197.77													2.616	-2.616	
833	197.88															
832	197.92															
833	198.00													6.867	0.981	
836	198.10															
836	198.11													5.232	-2.289	
837	198.19													4.905	-2.289	
837	198.69													1.635	-1.308	
838	198.79													0.654	-0.654	
839	198.90													-4.251	0	
839	199.05													-0.327	-0.981	
839	199.15													-0.981	-1.308	
840	199.22													0.327	-0.981	
840	199.67													9.81	2.289	
841	199.80													8.829	4.251	
842	199.89													9.81	2.943	
842	199.98													6.54		
842	200.08														4.905	
844	200.11														5.559	
844	200.16															
844	200.21														4.905	

(Converted datas,

as plotted on graphs, y-axis)

TEST SITE NO.2, PHALEN MINE

HIGH SIDE MAXIMUM STRESS

Face & Support	Day Number	Support 782	Support 786	Support 790	Support 796	Support 800	Support 806	Support 810	Support 814	Support 818	Support 822	Support 828	Support 832	Support 836	Support 840	Support 844
784	179.65	0	0	0		0	0	0	0	0	0	0	0	0	0	0
786	179.82			-17.188		-23.336	-32.695	-11.977	-6.8033	7.66802	5.56646	-15.262	-0.5795	9.72066	-58.640	-2.7169
786	179.88															
788	[illegible]			1.99294		-16.556	-6.2106	10.2892	4.08613	-2.1121	10.2844	-6.2274	-4.1781	12.3462	10.1964	1.98651
788	[illegible]															
790	184.19			9.70486		-15.056	-6.7778	11.7792	2.81910	-2.6917	5.58102	-6.7904	-4.7161	17.9776	7.80111	-2.7284
790	184.24															
790	[illegible]															
790	184.67															
790	[illegible]															
792	184.42															
792	184.54															
792	185.69															
792	185.90					-40.102	-2.9759	3.10927	-3.1267	13.8219	13.5668	7.17211	12.5663	17.5184	27.9828	5.7115
792	186.33					-61.158	-17.021	-9.6626	-26.034	-5.4582	-1.3309	-5.4628	-3.4134	-1.3264	17.1079	-4.7791
792	186.49					-47.616	-27.038	0.03019	-14.764	1.89470	-6.4150	6.01054	-6.8150	6.08746		-4.4167
792	186.67					-41.211	-51.634	-2.3857	-14.492	-6.1719	6.21217	-2.0606	-2.0732	-2.0227		-12.977
792	186.79															
795	187.32															
795	187.56						-8.2464	6.09906	2.00035	14.4724	22.7201	20.8932	8.24895	20.6771	26.7558	14.7687
795	187.65						2.11346	18.6088	16.6082	4.17538	26.8562	14.4049	10.3611	22.7326	29.9607	27.1661
796	187.73															
796	187.85						-1.1076	-1.2081	-11.592	-7.3059	0.91657	-9.4055	-3.2942	12.7122	19.4261	2.08777
797	188.27															
797	188.31					-56.443	-52.433	-6.9711	-13.161	-22.496	-2.0607	-11.169	-6.9702	1.32768	9.46224	-77.168
798	188.53															
798	188.67															
800	188.78					-98.295	-38.418	-26.056	-40.378	-44.664	-19.845	-40.396	-36.391	-32.242	-1.5027	-21.898
800	[illegible]					-104.90	-63.726	-5.8354	-13.904	-22.567	4.6782	8.78927	-7.7811	10.8015	27.2463	22.2288
802	190.22					-65.022	3.23498	13.5445		17.6663	5.18776	22.8541	9.38767	21.7922	28.2277	44.4617
805	190.38						-6.1593	8.20666	-4.1228	2.00823	6.23638	4.12811	-10.771	10.3106	20.5199	1.92484
806	190.47						-6.1961	-2.0103	-12.332	-6.1719	-2.1109	0.19868	4.06741	24.7826	26.7477	10.0972
807	190.54															
807	190.88							8.05266	0.55873	-7.7045	15.0017	10.9030	4.69214	15.0268	22.1856	1.29721
809	191.21															
811	191.40							-13.660	-21.920	-21.971	-13.772	-12.672	-26.168	-12.697	2.69688	-11.711
812	191.42															
812	191.47															
812	191.54															
814	[illegible]															
814	[illegible]								-11.765	-5.6048	-1.5430	8.76571	-202.79	25.3456	27.2114	11.6642
814	192.22															
815	192.28															
817	192.42															
818	[illegible]									5.79976	-4.5852	3.68759	-214.12	2.71277	7.71089	2.29945
819	192.56									-30.096	4.27976	6.34168	-213.56	4.29272	16.6812	-20.661
822	193.21															
822	[illegible]										-13.156	-42.324	-216.59	-21.466	7.21744	-19.892
823	[illegible]															
824	[illegible]										-104.10	-58.652	-222.62	-27.838	7.59267	2.33358
824	193.28												-218.31	5.79978	26.4318	2.66134
824	193.41												-221.54	8.77706	21.1259	1.37756
826	[illegible]															
826	193.87												-226.77	-4.7411	-0.6672	-8.1027
826	[illegible]															
827	194.06												-212.39	-61.671	8.58462	
828	194.22												-222.40	7.86170	-6.4865	
829	194.25												-246.43	4.6787	-1.6218	
829	194.38															
829	194.42												-258.75	6.93384	23.2789	
830	194.48															
832	197.00													-3.3631	-2.4637	
833	197.08													-11.492	-7.4316	
833	197.16													-13.567	-2.2701	
833	197.77													-84.751	16.4715	
833	197.88													-9.4307	9.12654	
833	197.92															
833	198.00															
836	198.10													-29.491	42.9017	
836	198.11															
837	198.19													-17.263	24.0888	
837	198.69													-12.560	26.7169	
838	198.79													-3.6196	25.2597	
839	198.90													0.34189	31.4706	
839	199.05													-43.463	39.1764	
839	199.15													-3.3693	25.3819	
840	199.22													-13.904	27.3217	
840	199.67													-0.3795	32.3859	
841	199.80													-60.739	17.9022	
842	199.89													-42.763	7.51726	
842	199.98													-58.677	13.7532	
842	200.06													-29.118		
844	200.11														-0.9617	
844	200.16														-5.6777	
844	200.21														-7.1475	

(Converted datas,

as plotted on graphs, y-axis

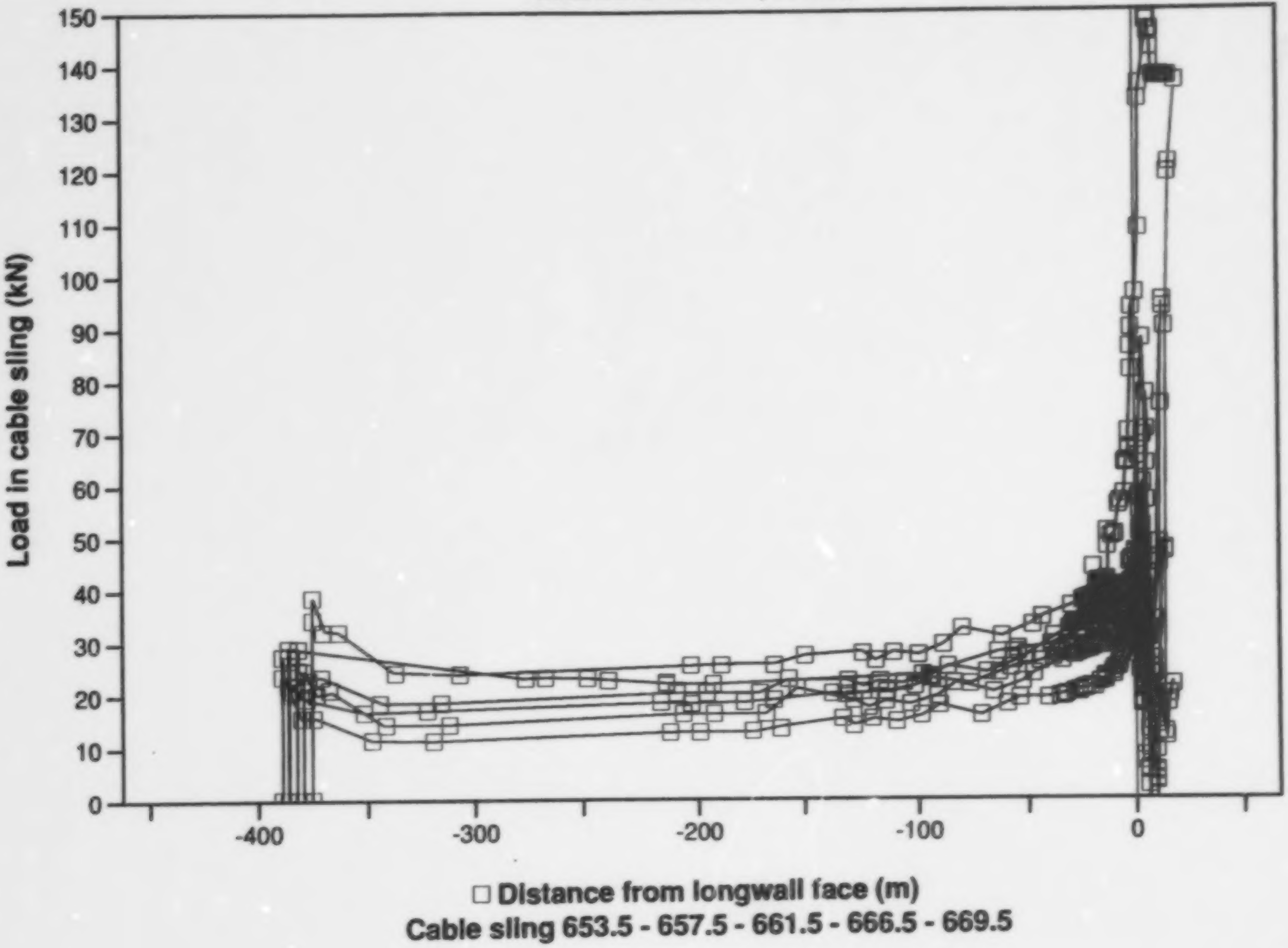
APPENDIX 5

GRAPHS
OF
LOAD IN CABLE SLINGS

TEST SITES NO. 1 AND 2

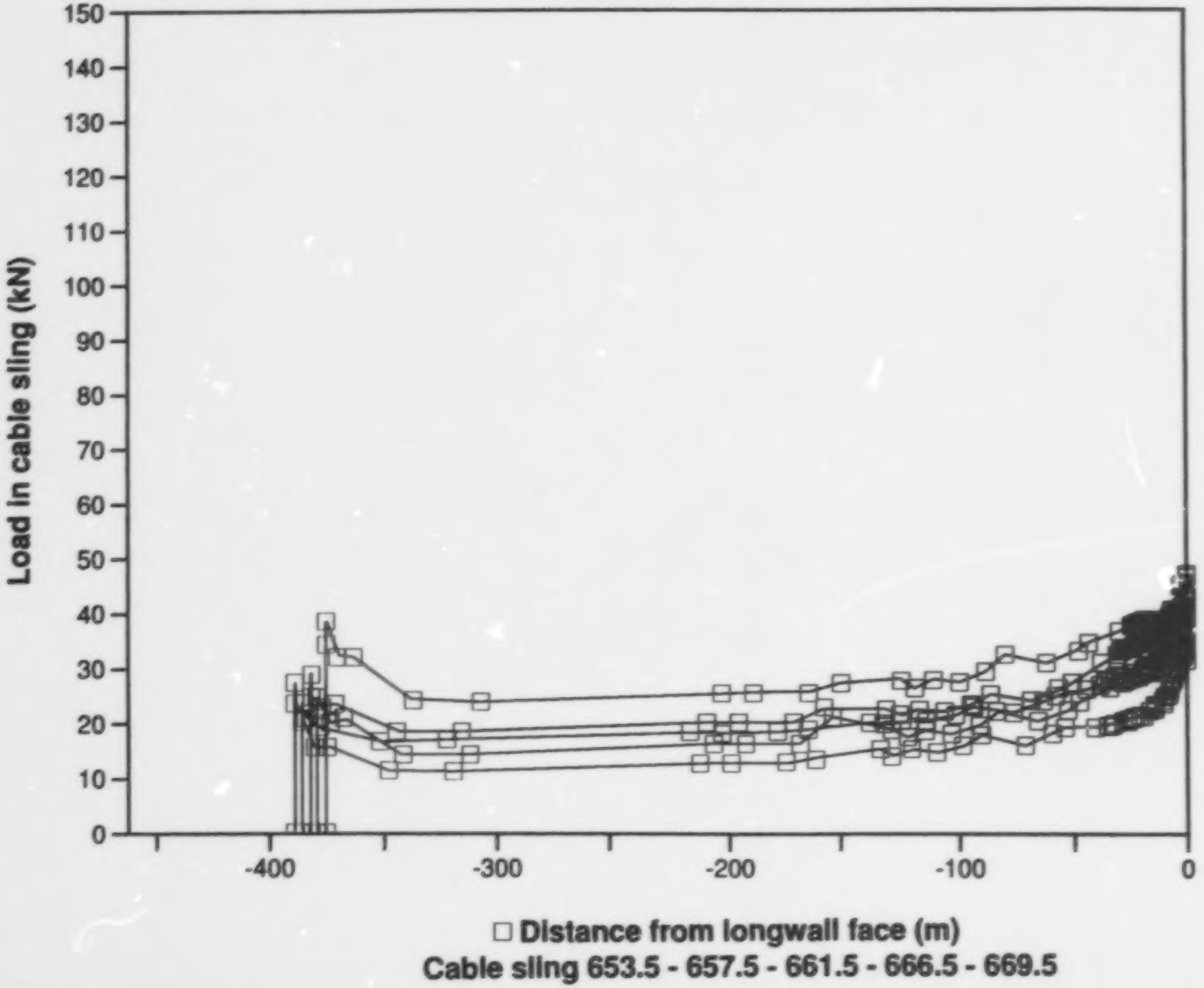
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



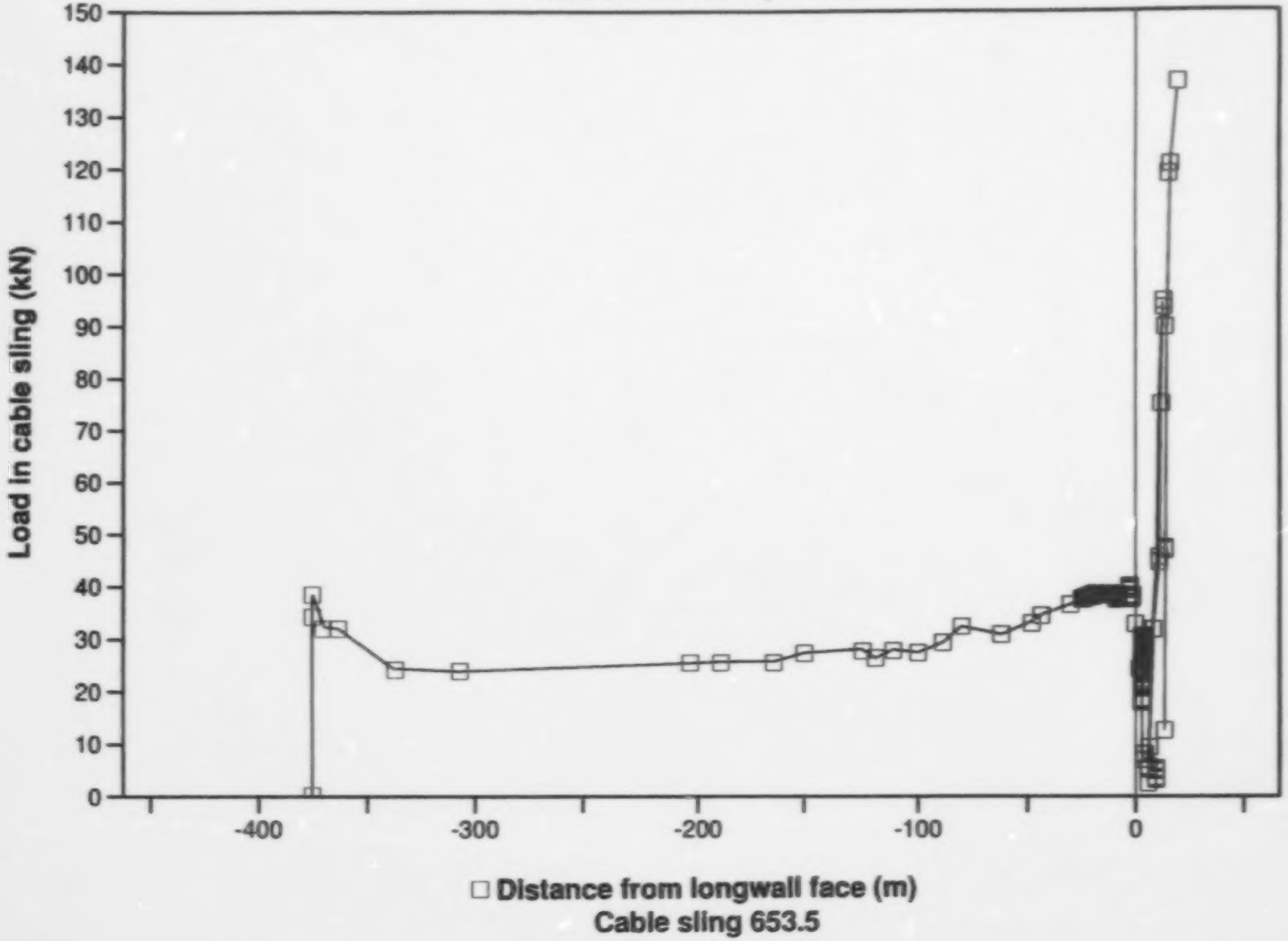
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



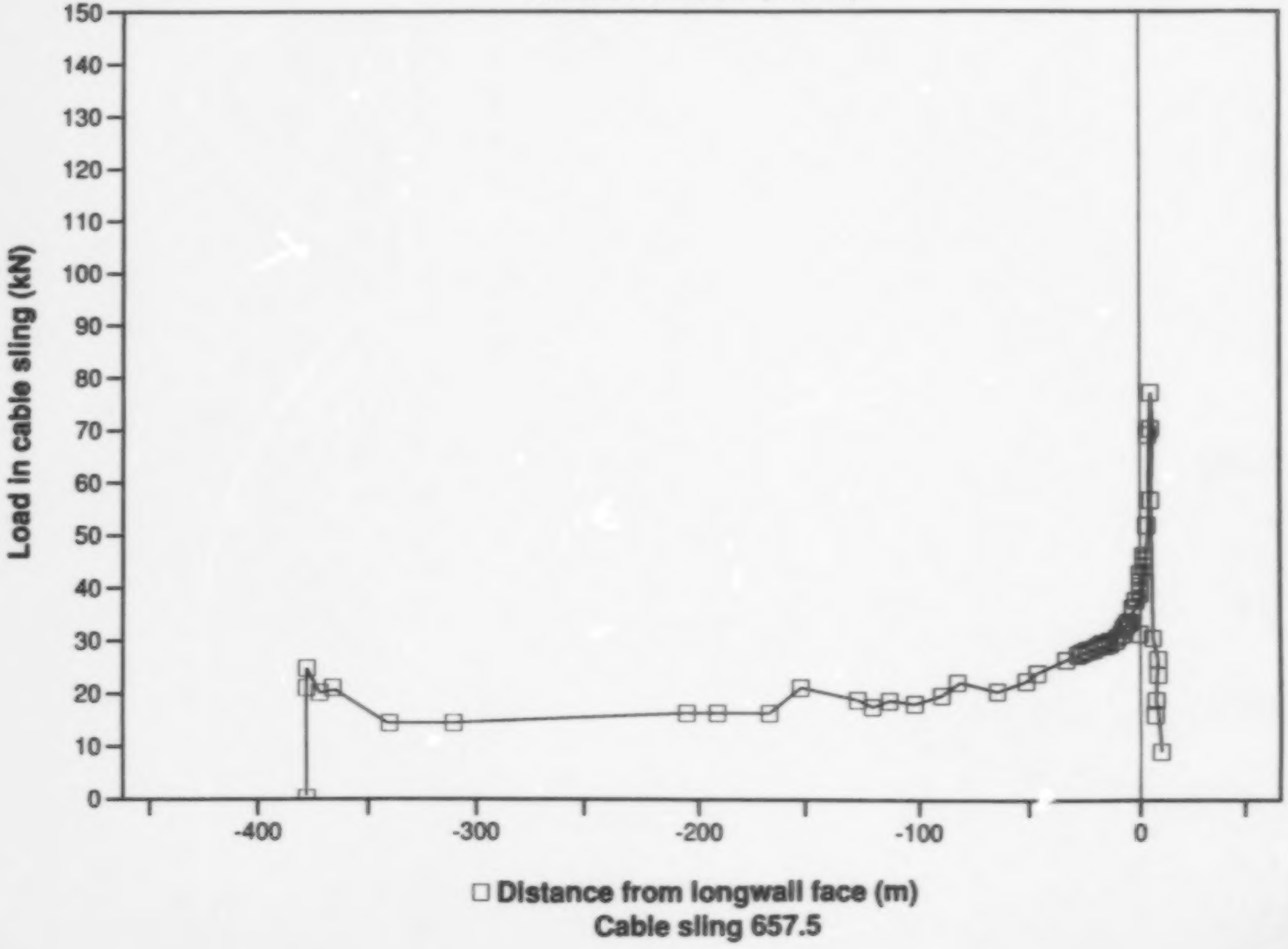
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



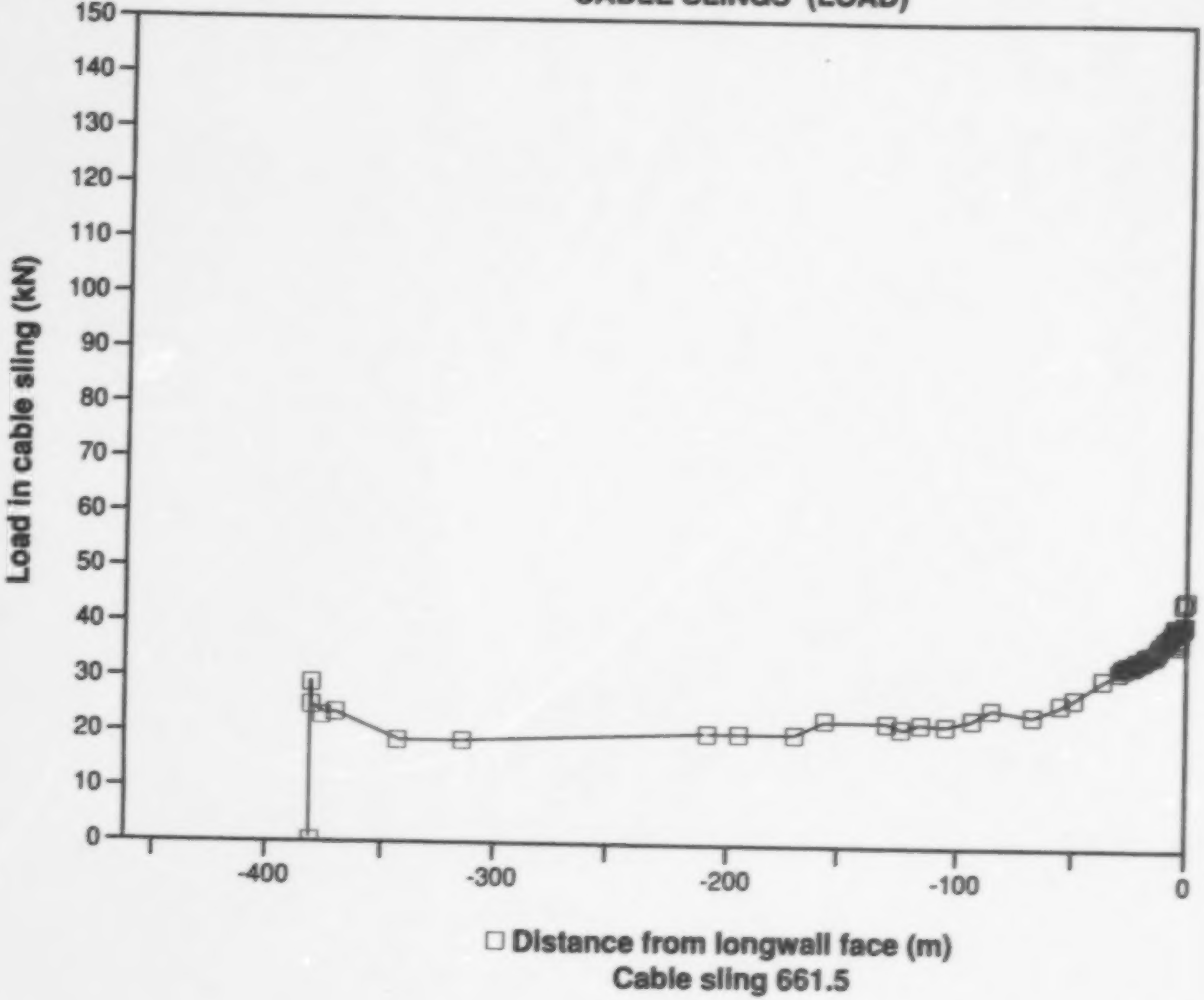
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



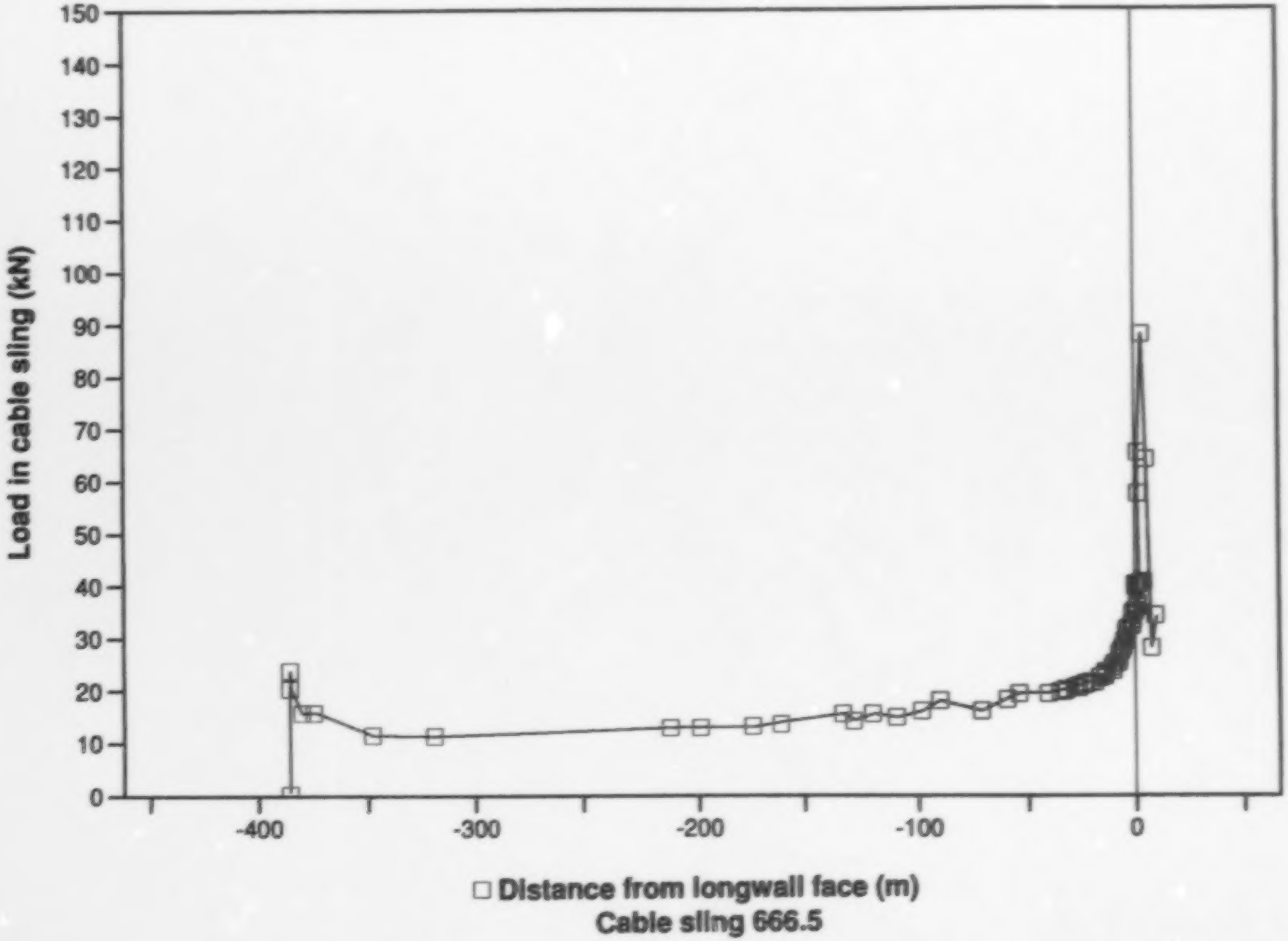
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



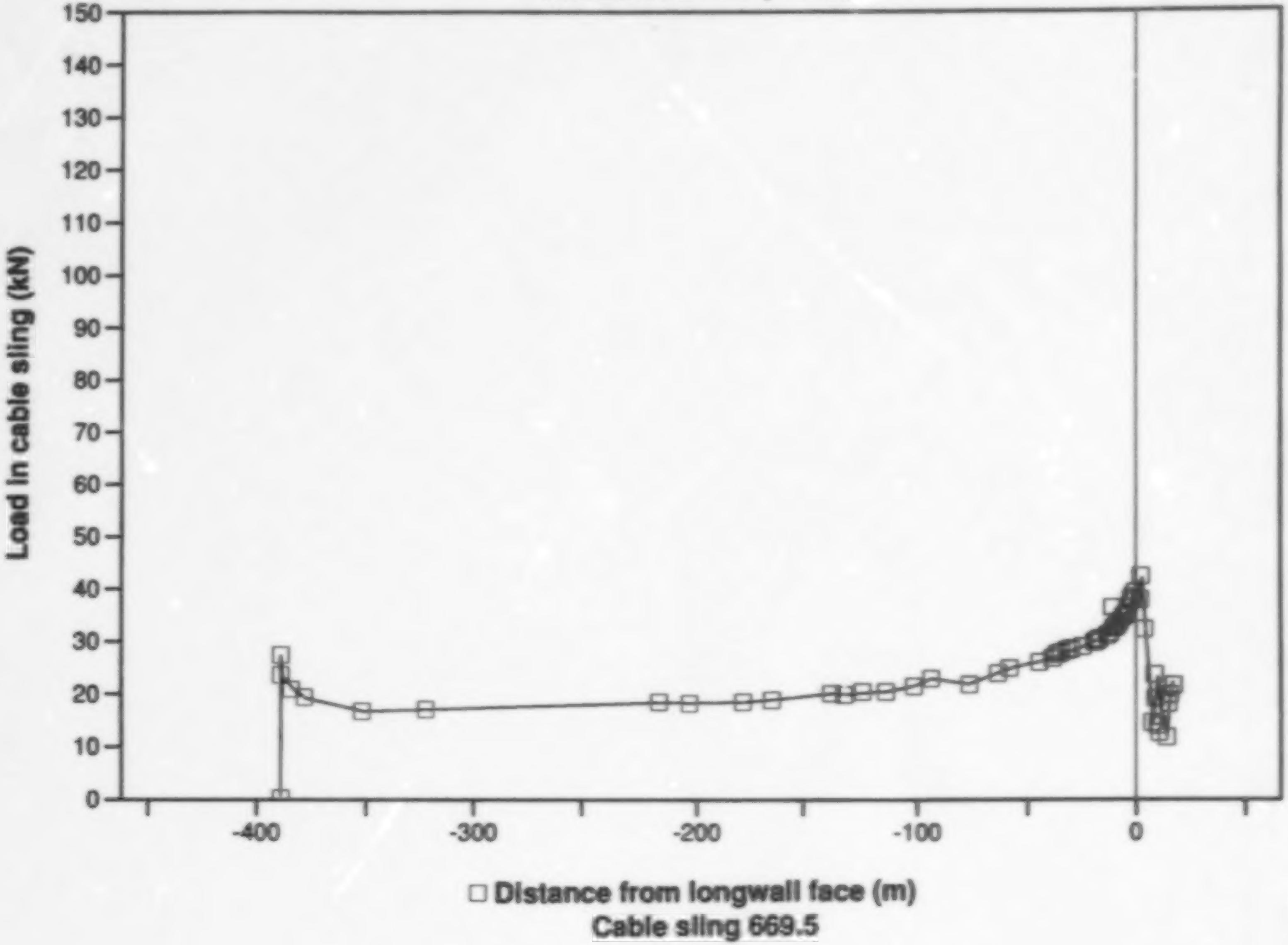
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



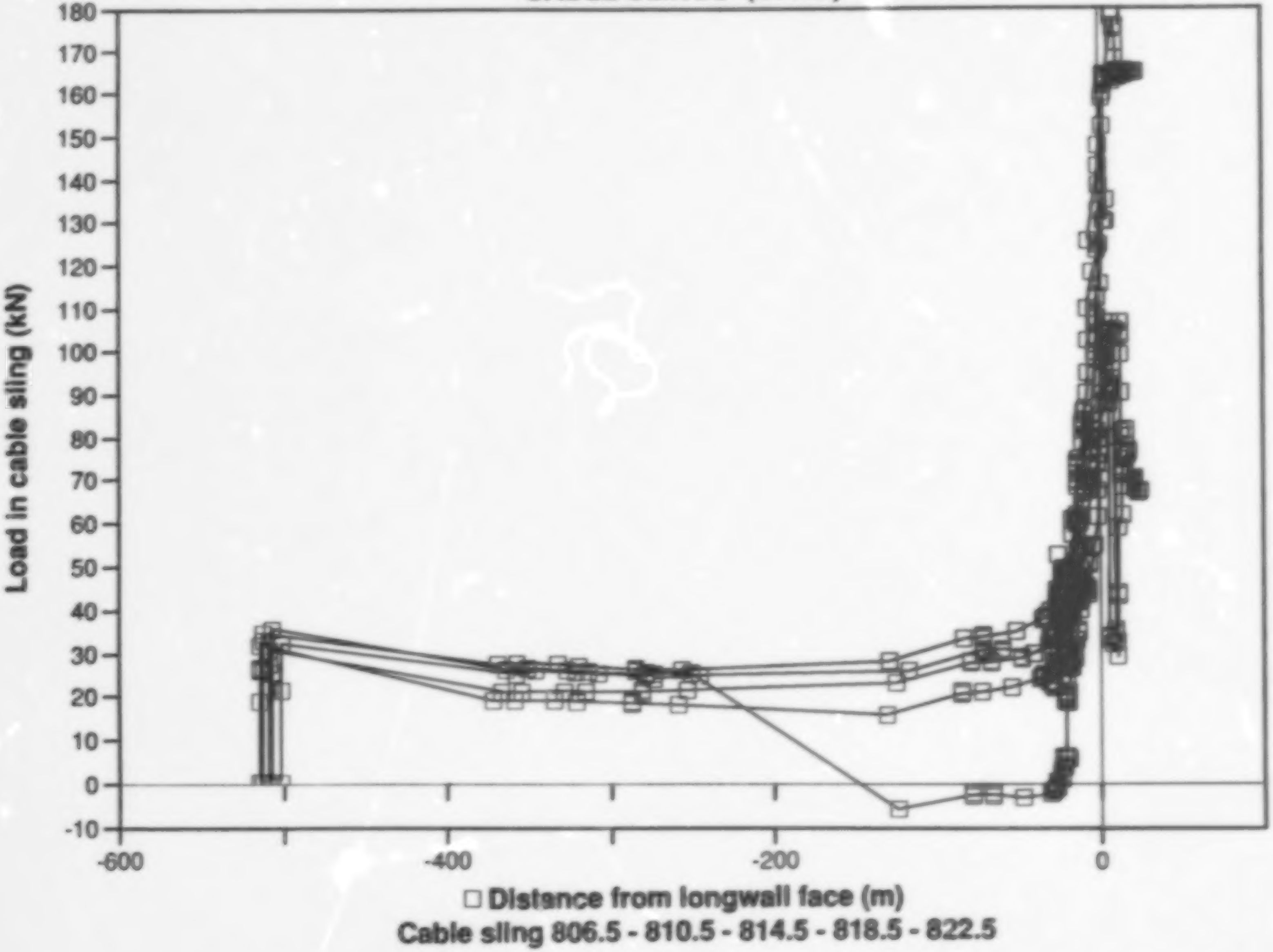
TEST SITE NO. 1, PHALEN MINE

CABLE SLINGS (LOAD)



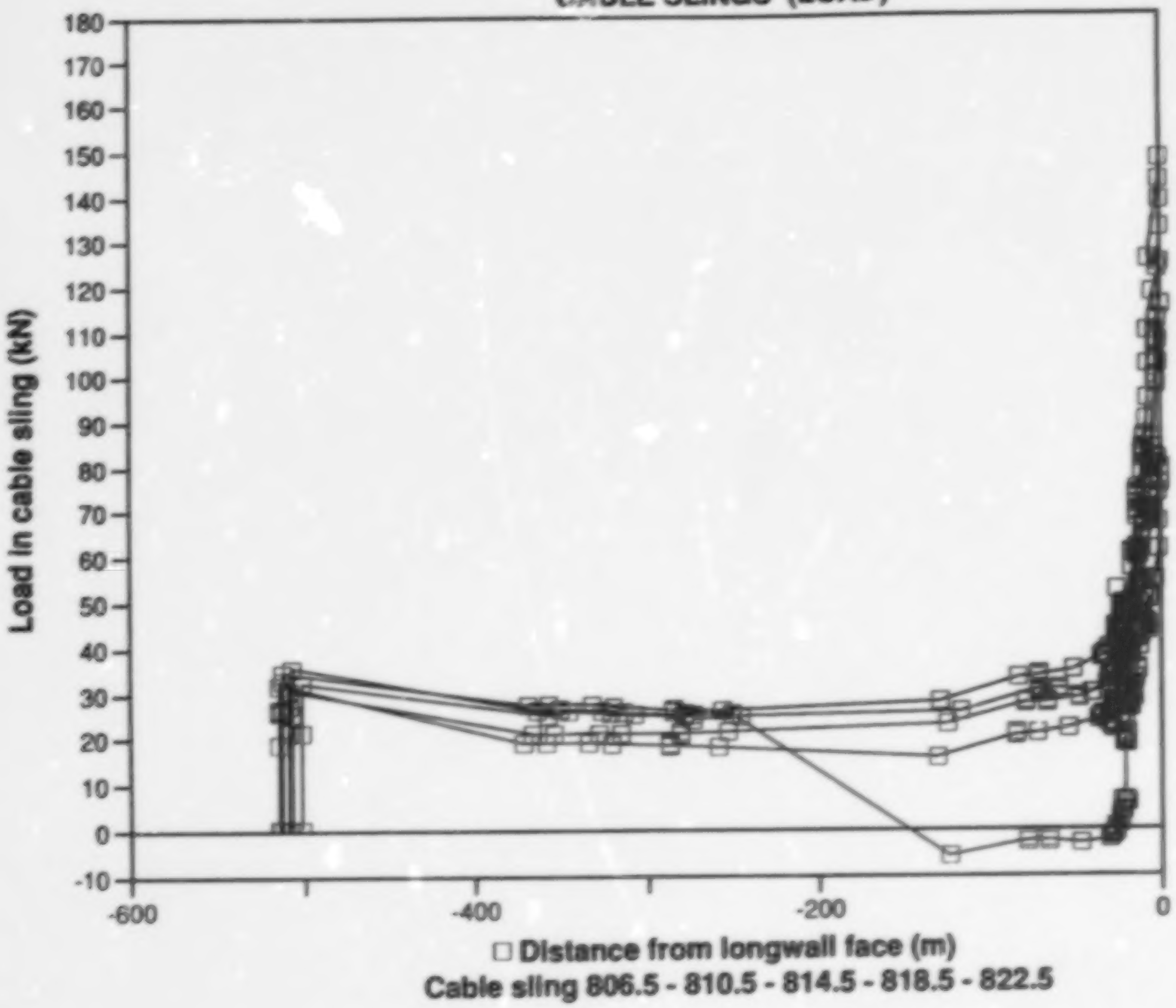
TEST SITE NO. 2, PHALEN MINE

CABLE SLINGS (LOAD)



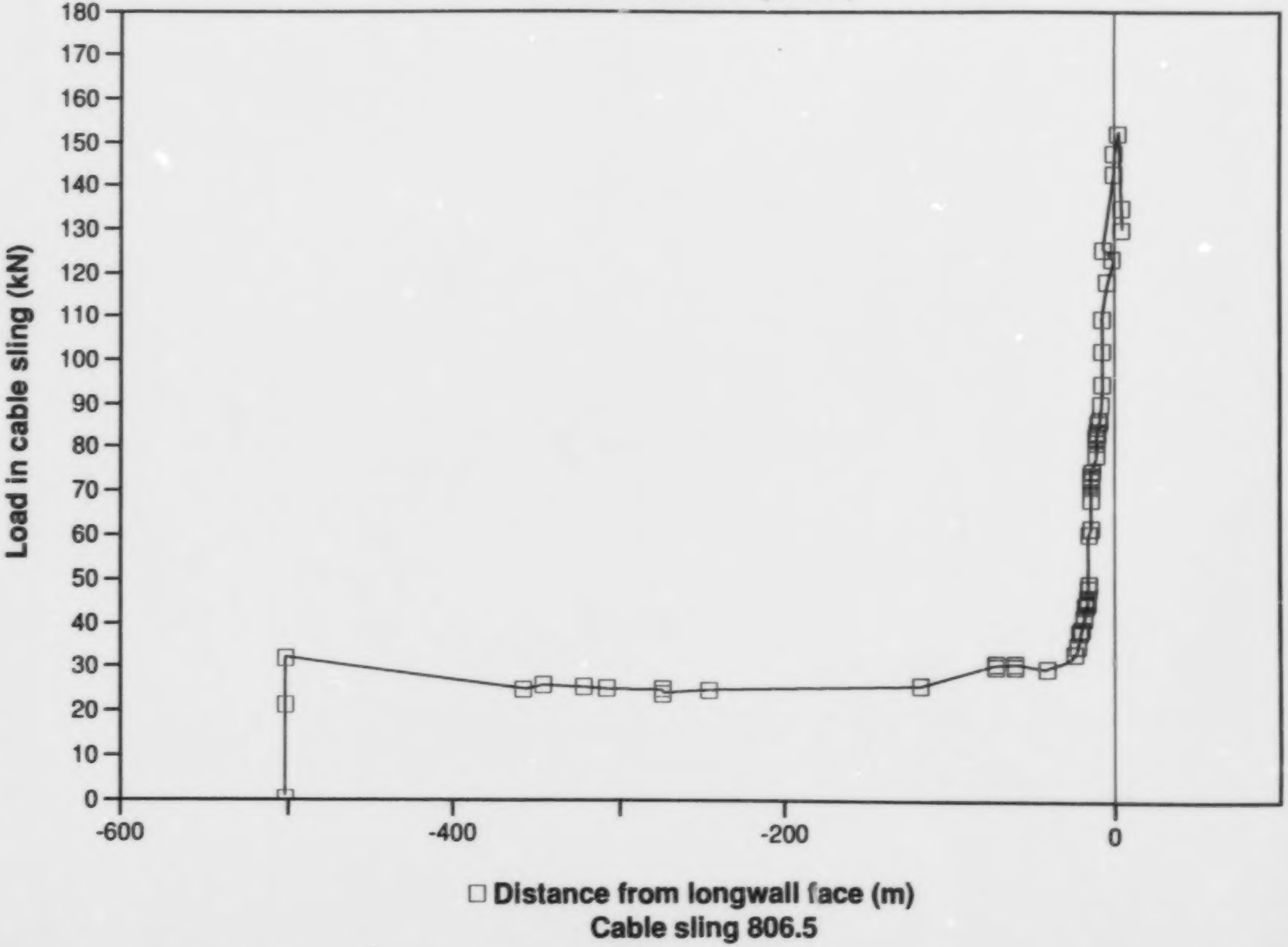
TEST SITE NO. 2, PHALEN MINE

CABLE SLINGS (LOAD)



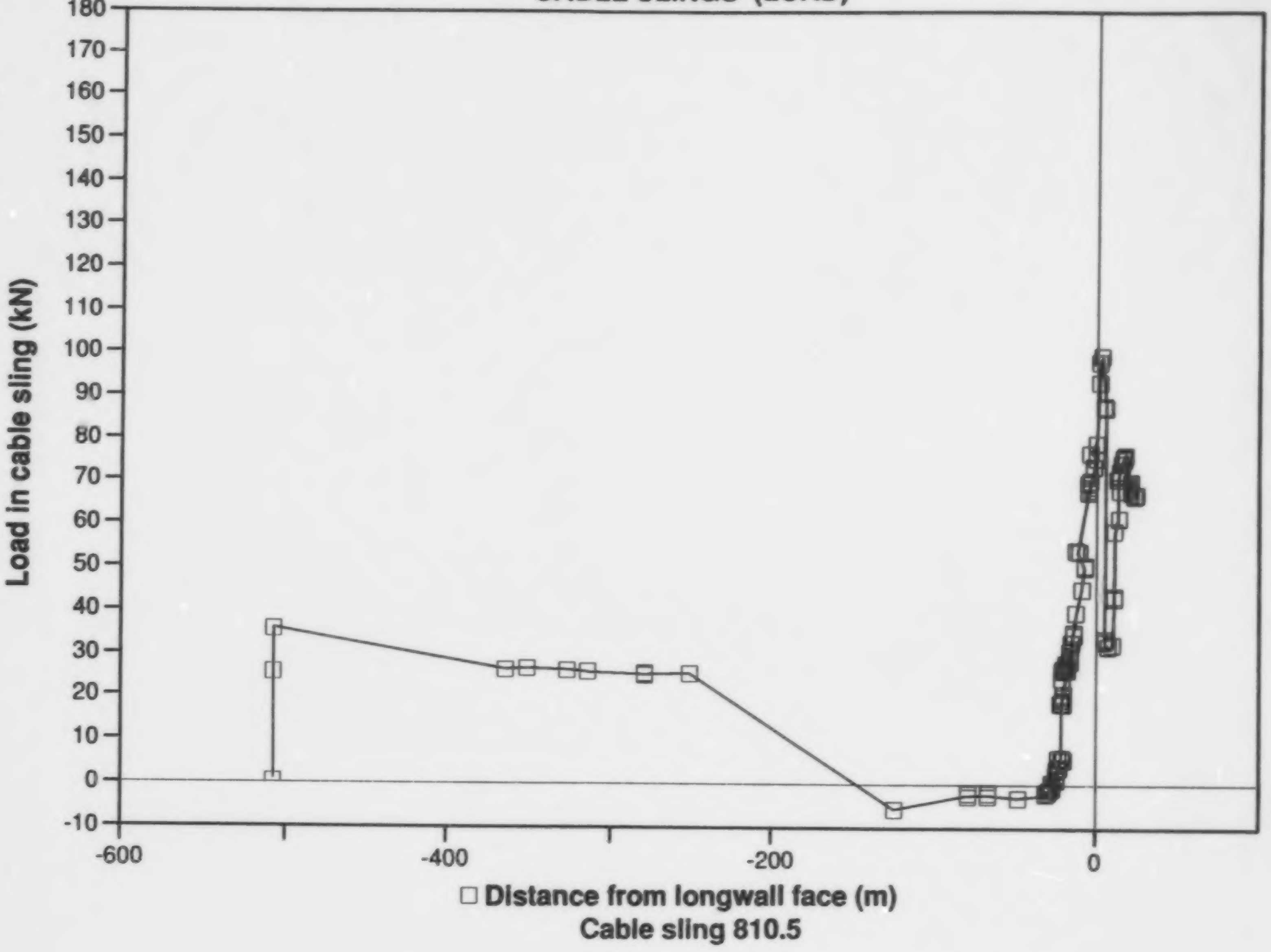
TEST SITE NO. 2, PHALEN MINE

CABLE SLINGS (LOAD)



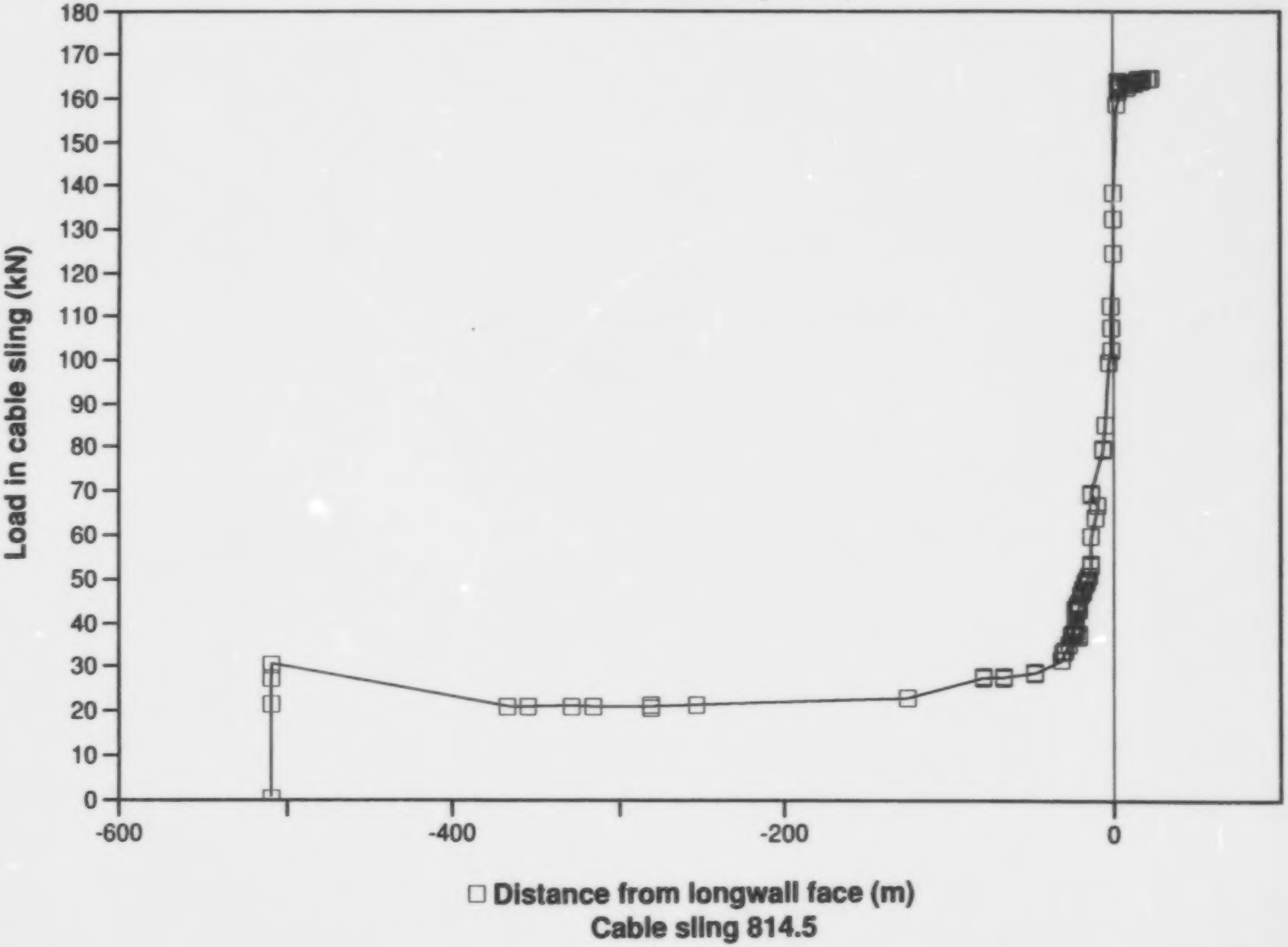
TEST SITE NO. 2, PHALEN MINE

CABLE SLINGS (LOAD)



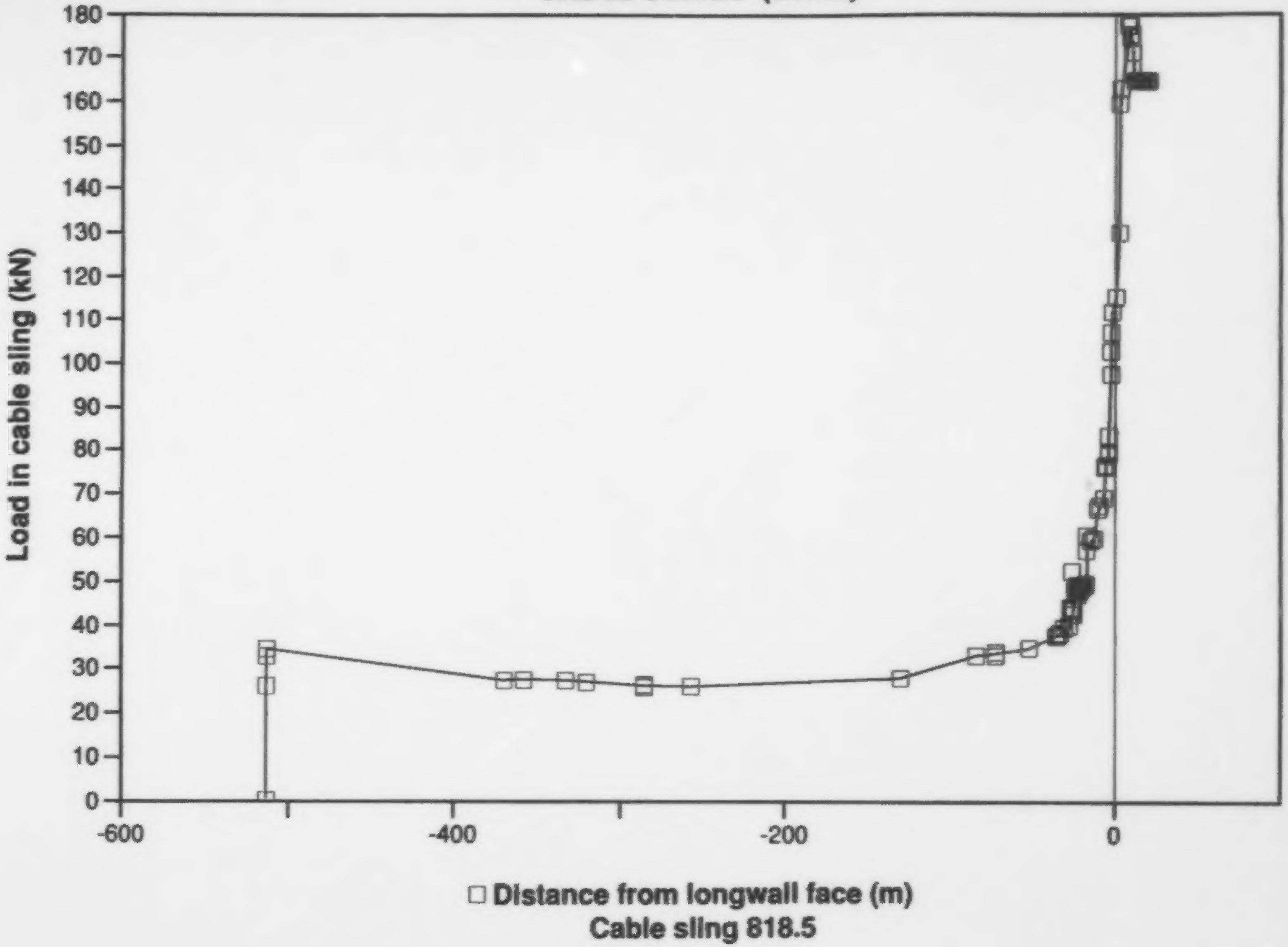
TEST SITE NO. 2, PHALEN MINE

CABLE SLINGS (LOAD)



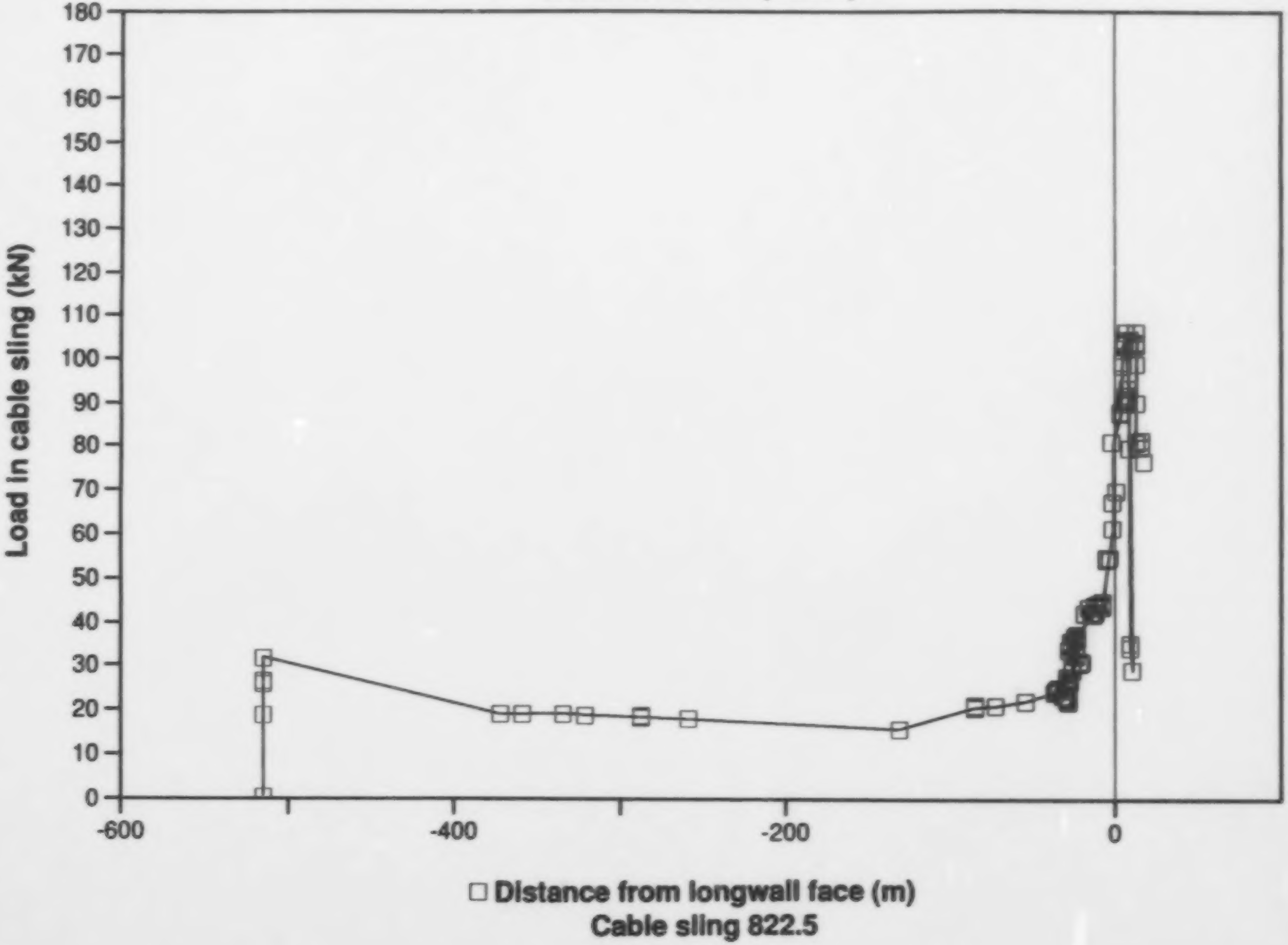
TEST SITE NO. 2, PHALEN MINE

CABLE SLINGS (LOAD)



TEST SITE NO. 2, PHALEN MINE

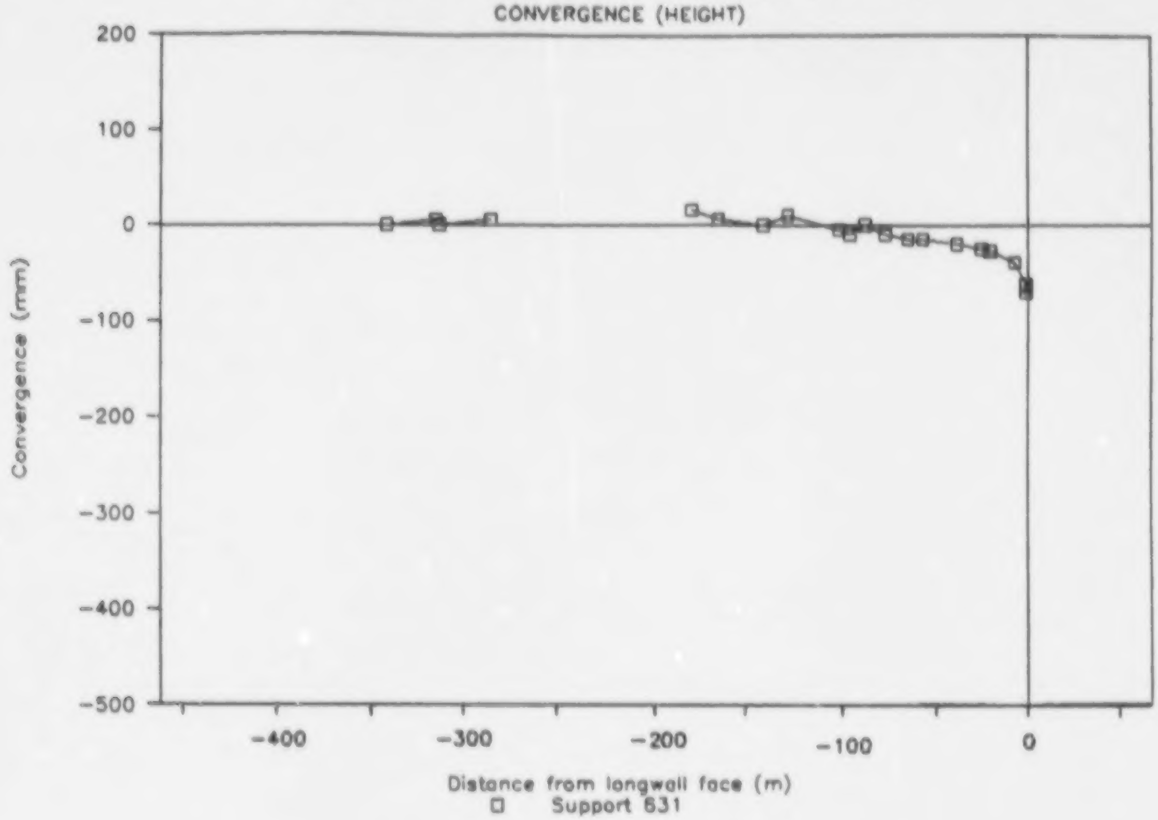
CABLE SLINGS (LOAD)



APPENDIX 6

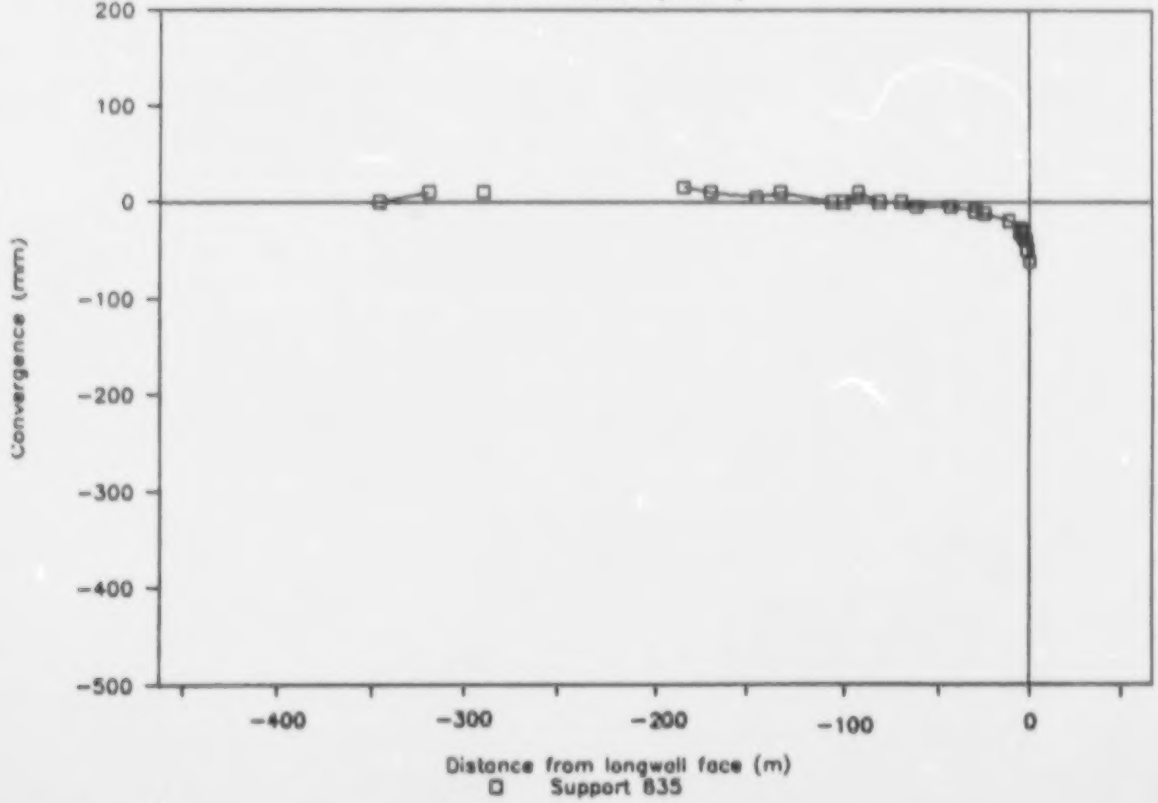
GRAPHS OF CONVERGENCE MEASUREMENTS

TEST SITES NO. 1 AND 2



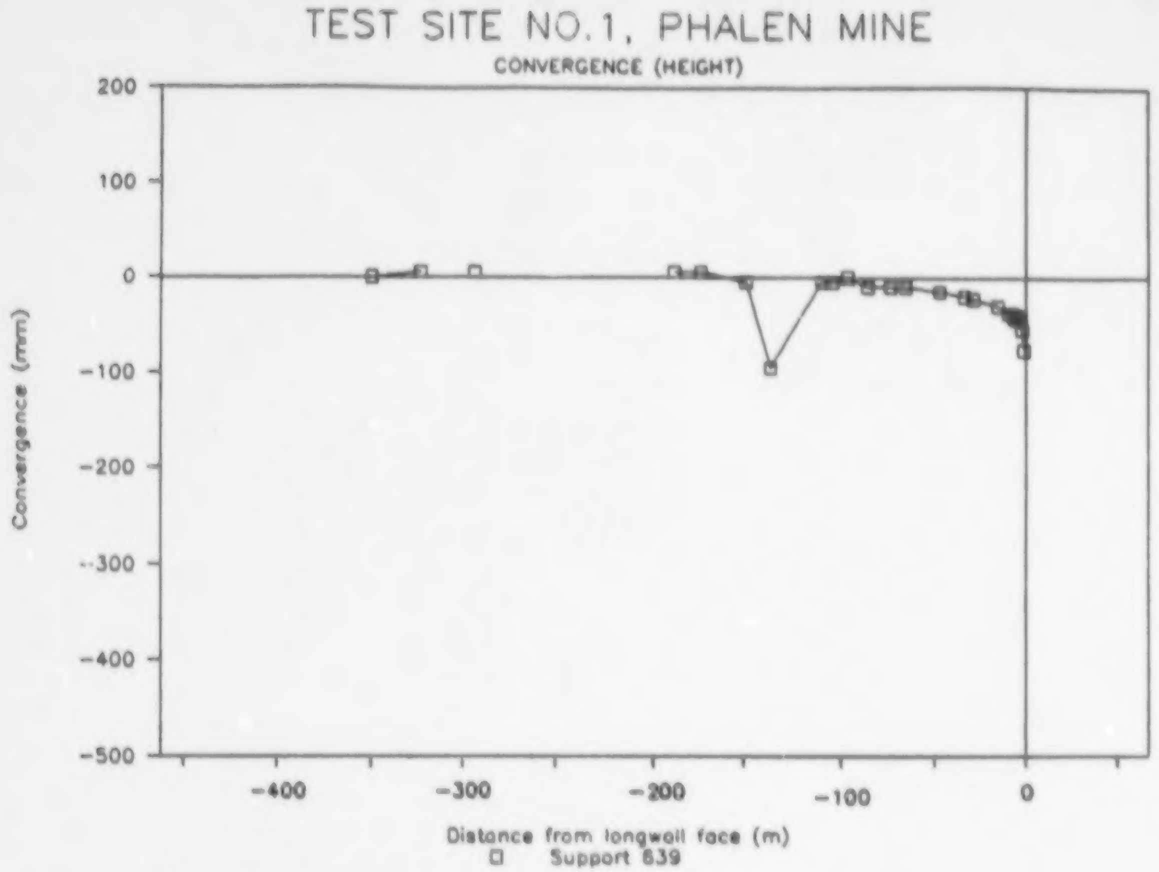
TEST SITE NO.1, PHALEN MINE

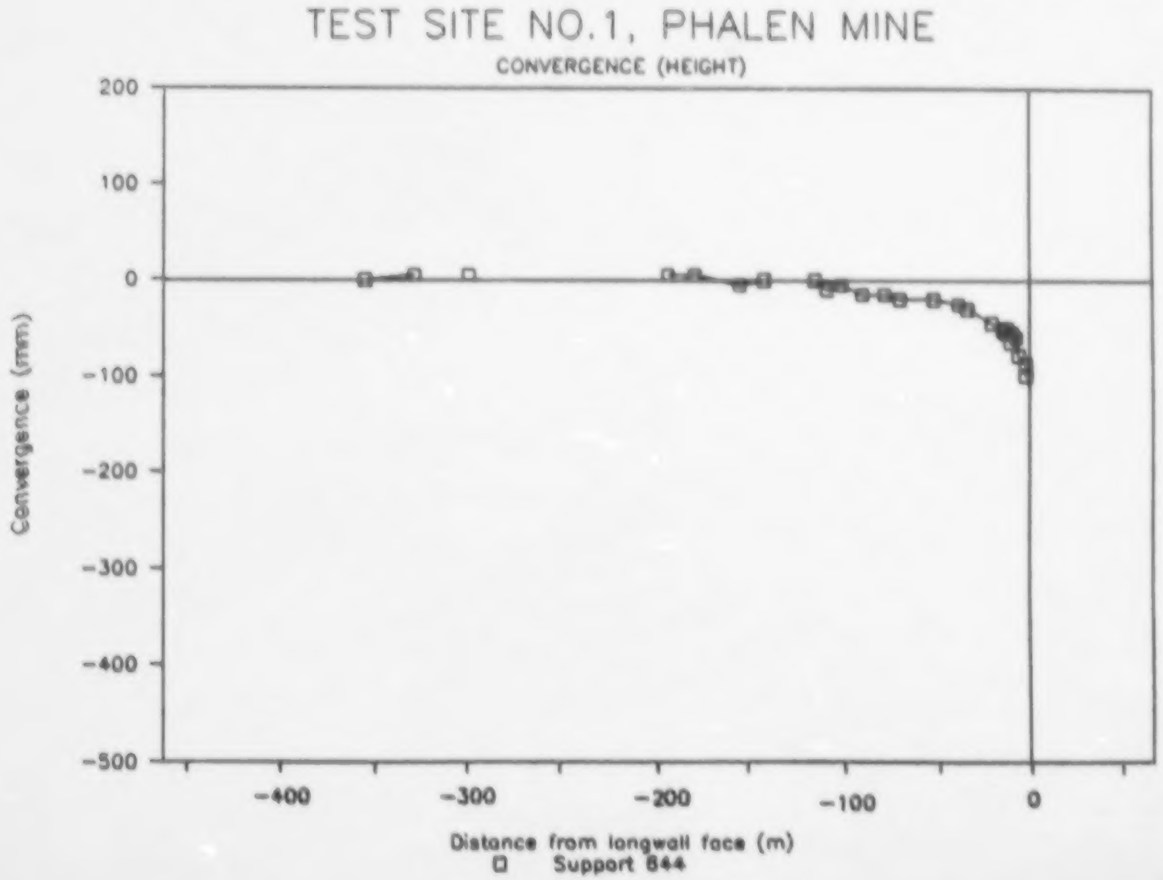
CONVERGENCE (HEIGHT)

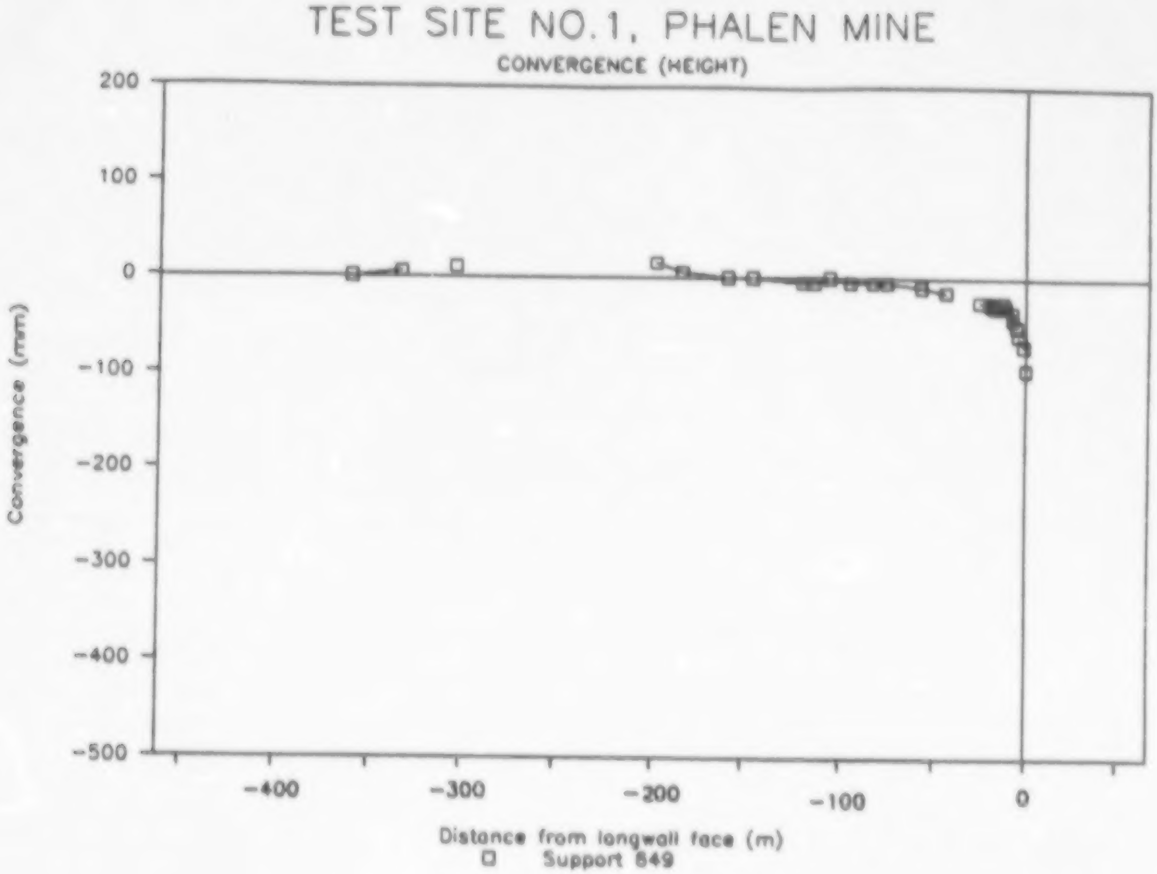


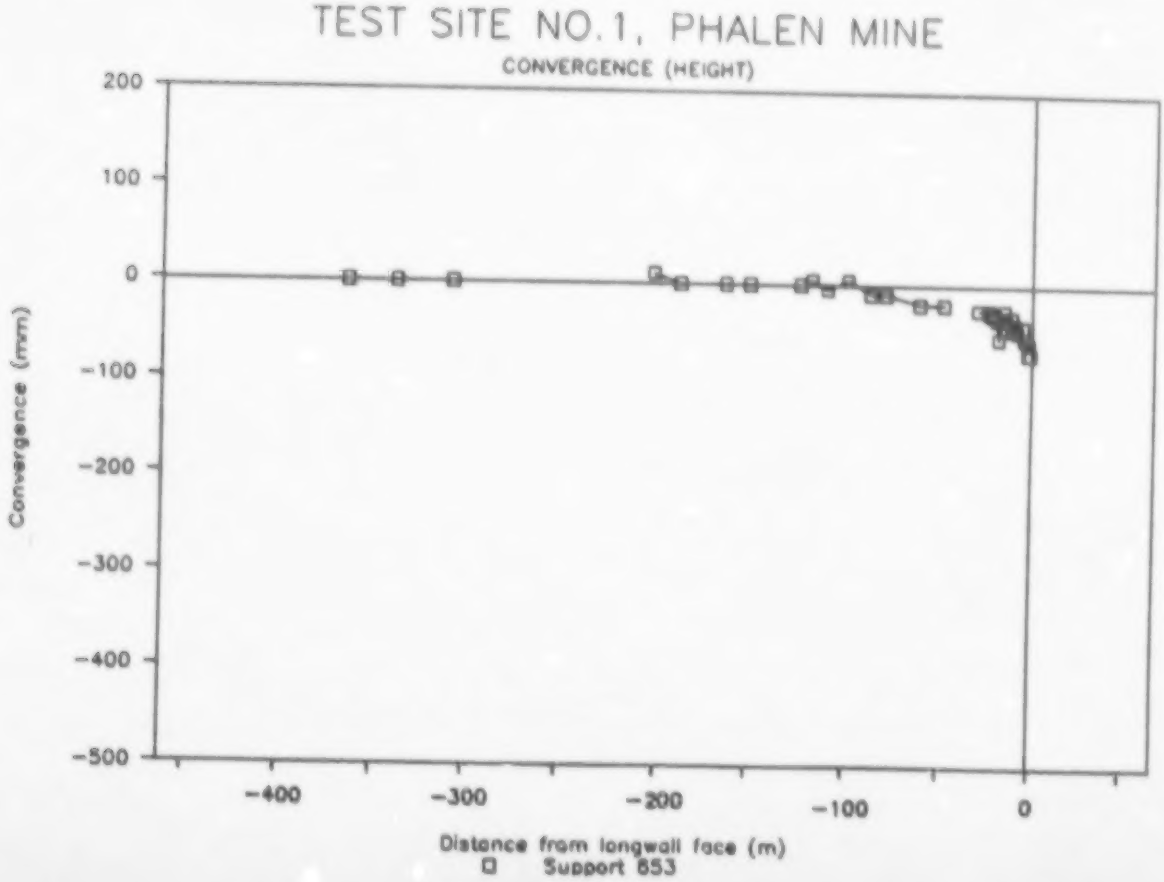
TEST SITE NO.1, PHALEN MINE

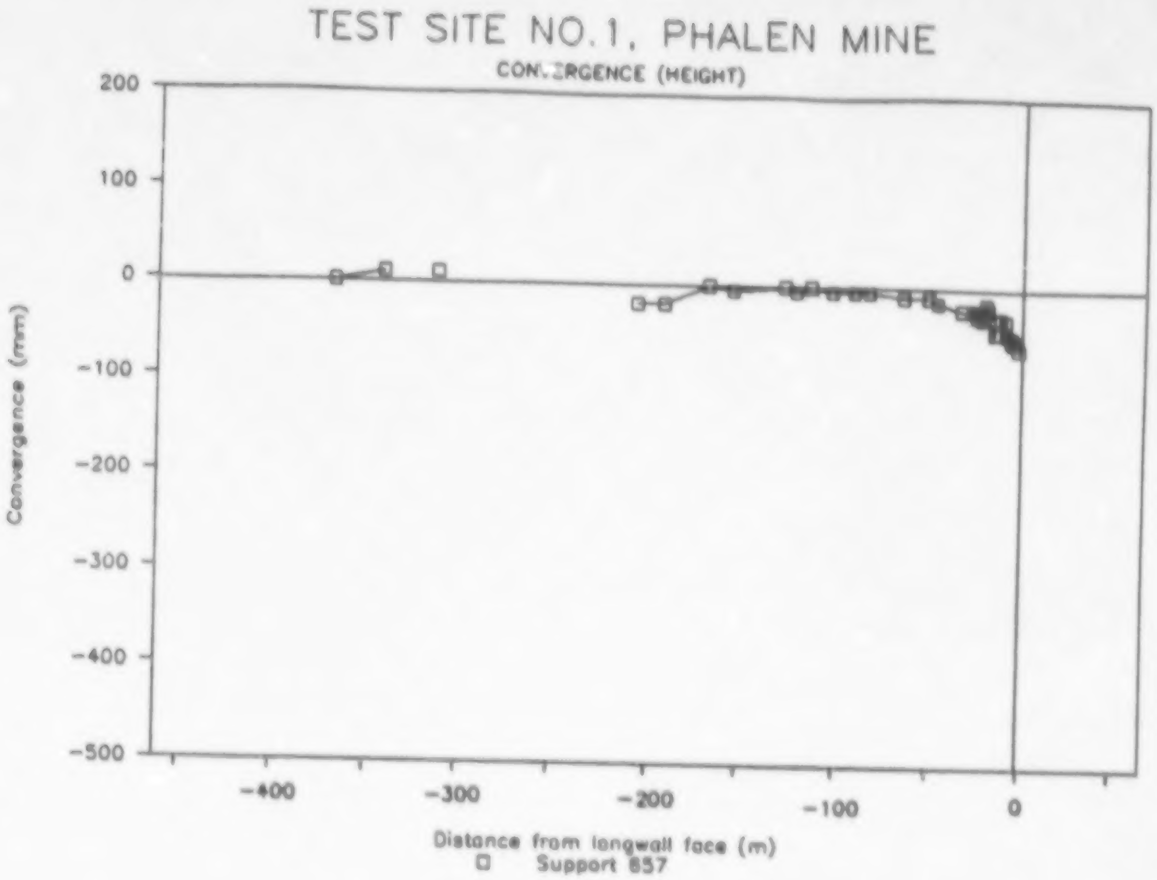
CONVERGENCE (HEIGHT)

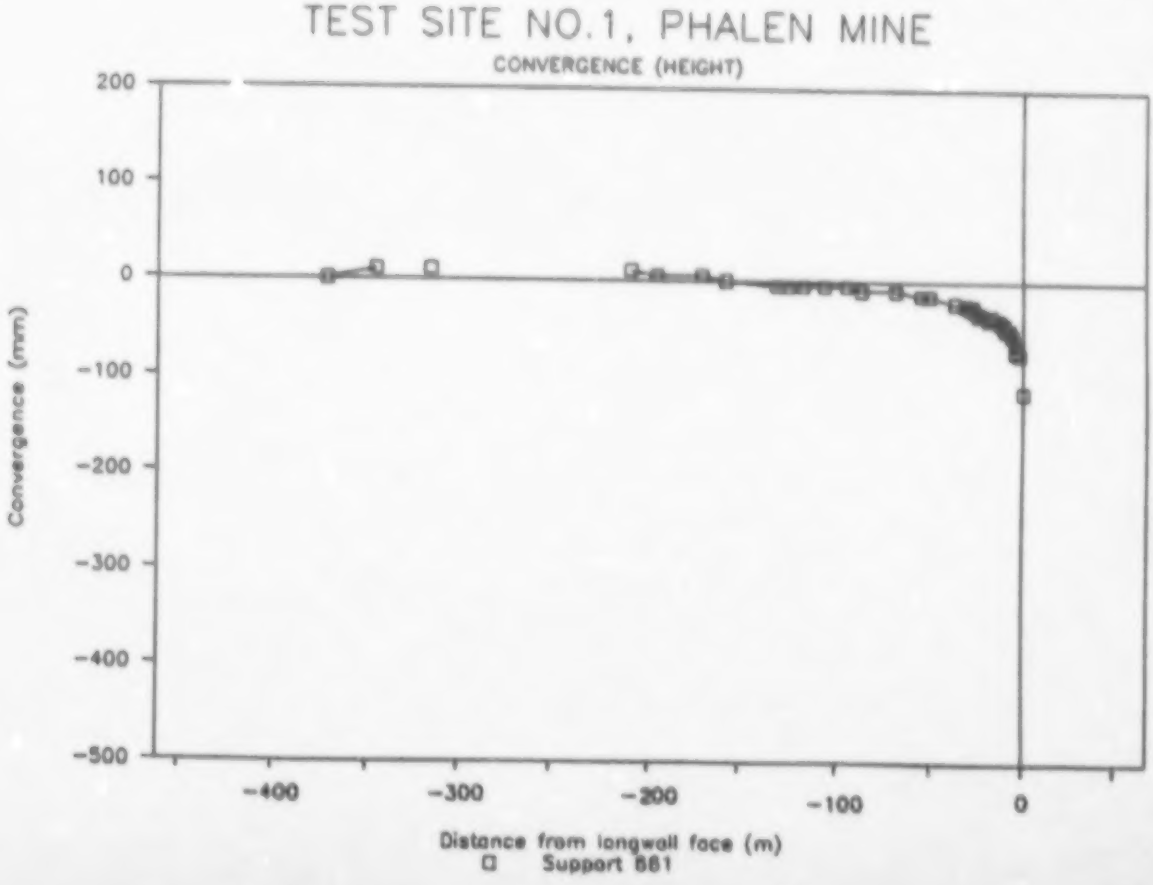

TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
200
100
0
-100
-200
-300
-400
-500
Convergence (mm)
-400
-300
-200
-100
0
Distance from longwall face (m)
□ Support 839

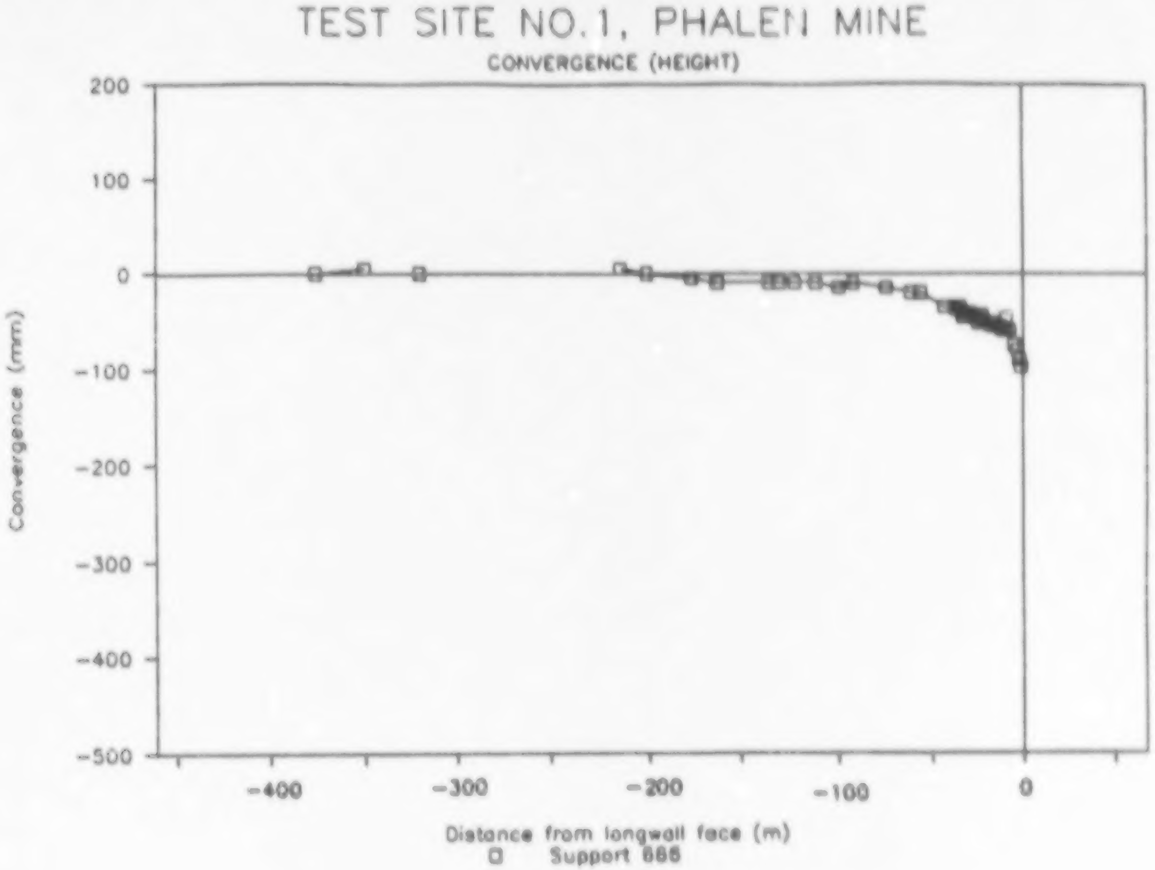

TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
200
100
0
-100
-200
-300
-400
-500
Convergence (mm)
-400
-300
-200
-100
0
Distance from longwall face (m)
□ Support 844


TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 849

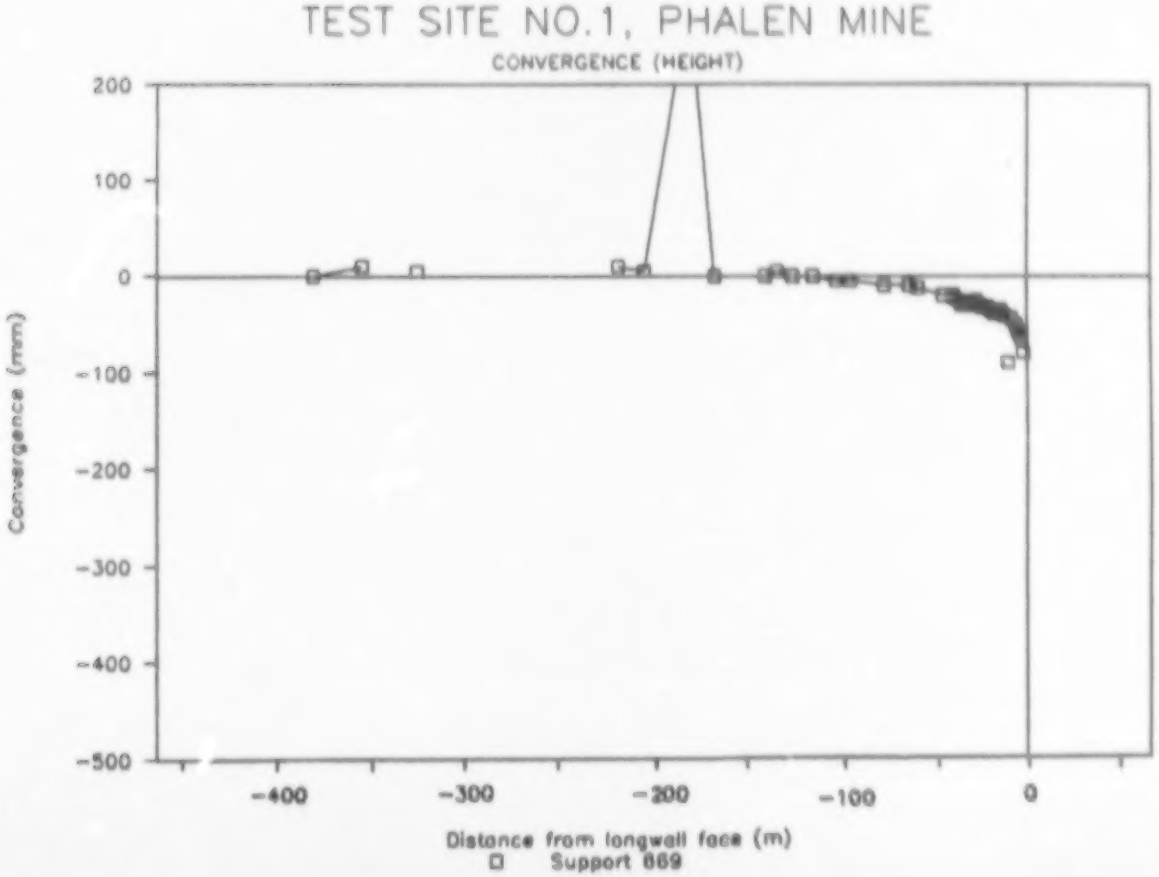

TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 853


TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
Convergence (mm)
200
100
0
−100
−200
−300
−400
−500
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 857

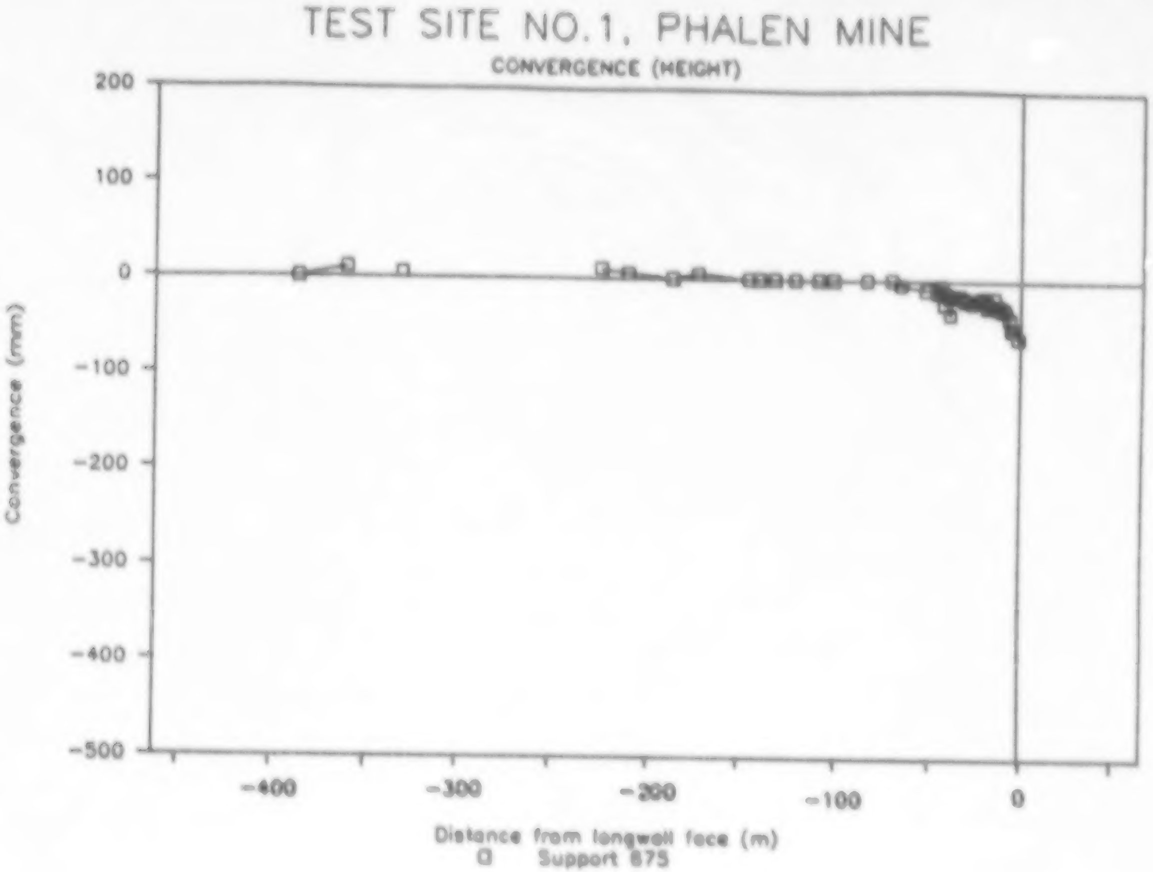

TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
Convergence (mm)
200
100
0
−100
−200
−300
−400
−500
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 881

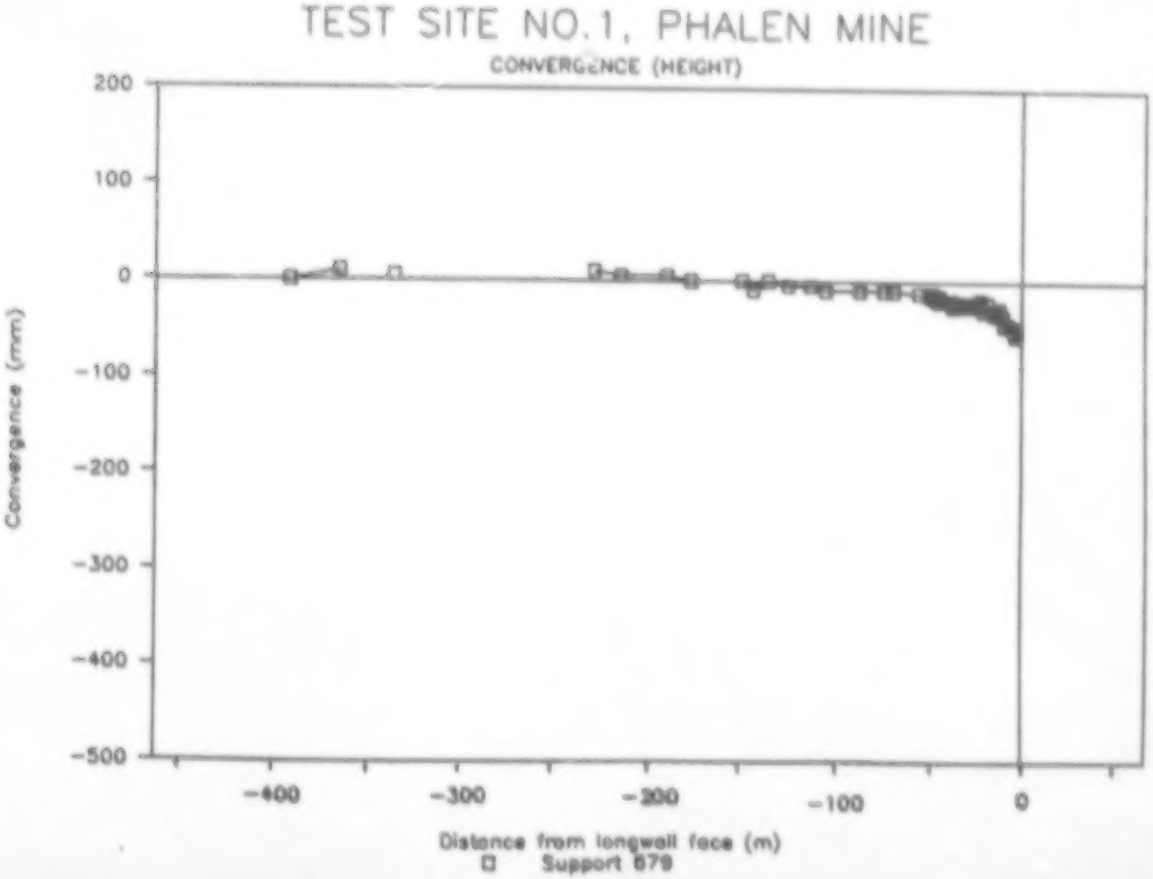

TEST SITE NO.1, PHALEN MINE

CONVERGENCE (HEIGHT)


TEST SITE NO.1, PHALEN MINE

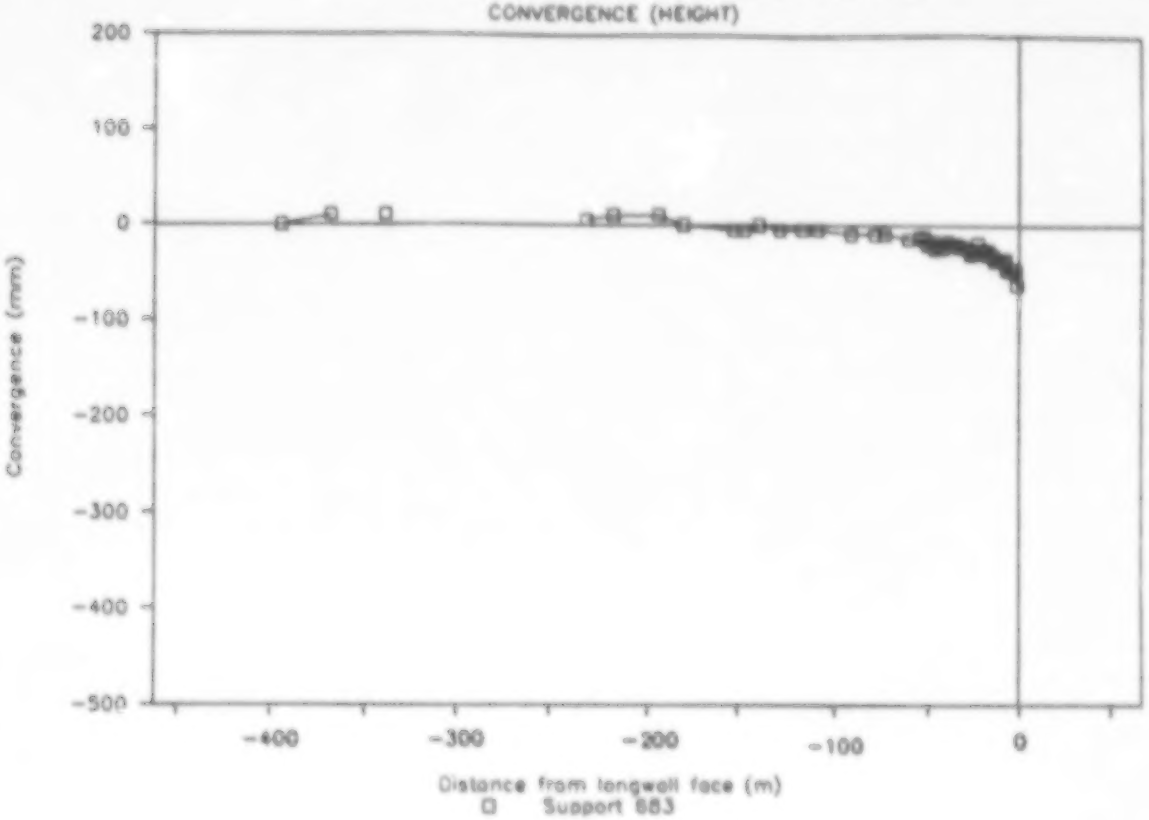
CONVERGENCE (HEIGHT)


TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 875


TEST SITE NO.1, PHALEN MINE
CONVERGENCE (HEIGHT)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 879

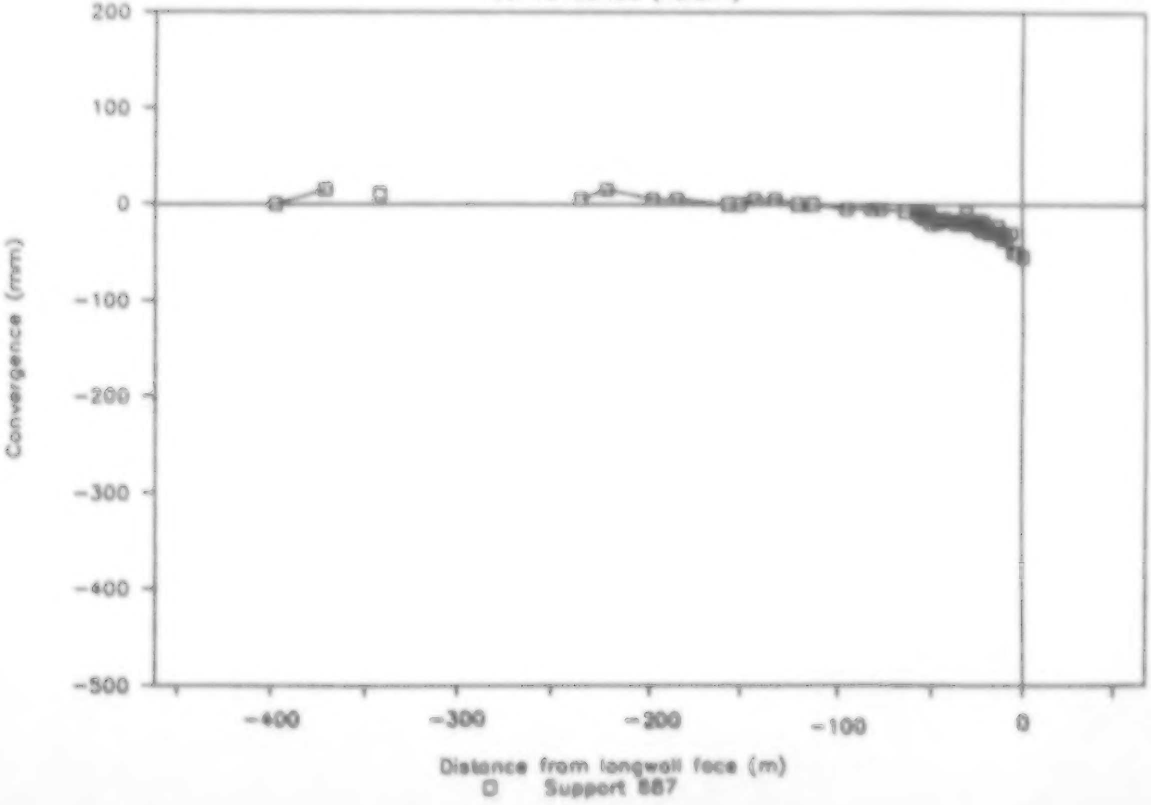
TEST SITE NO.1, PHALEN MINE

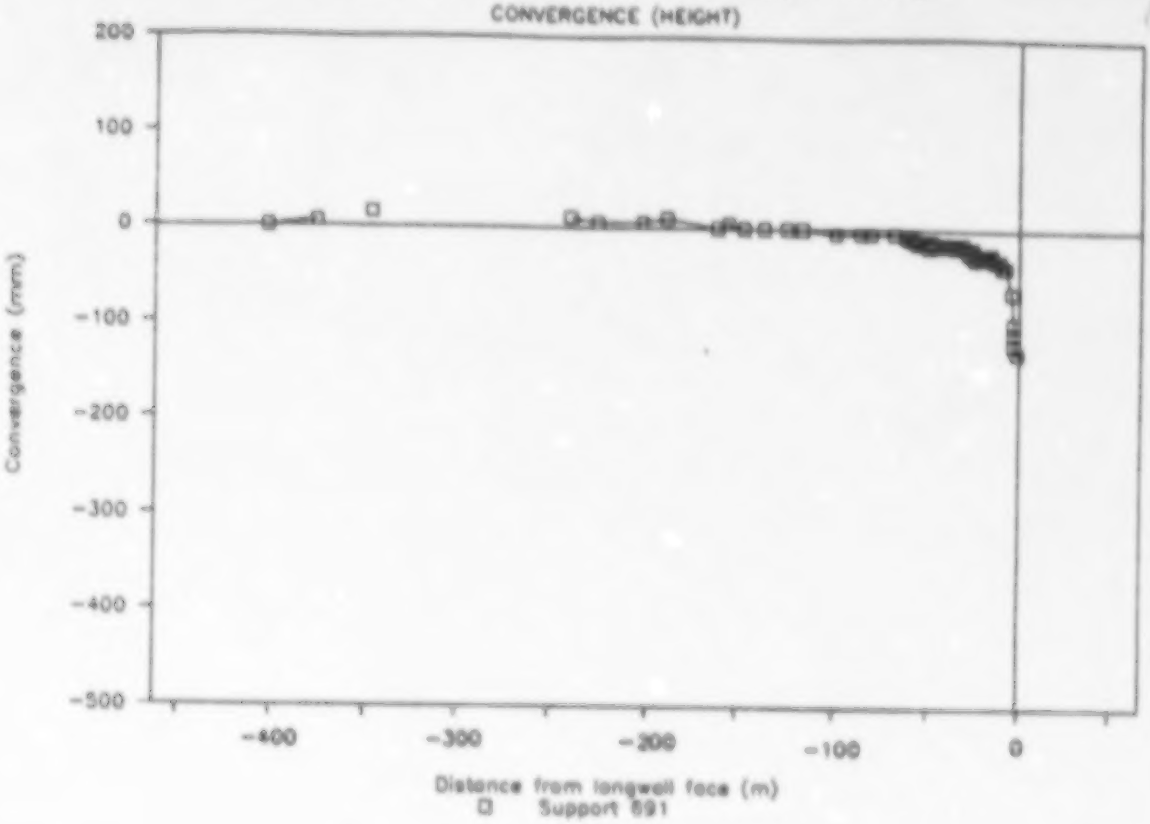
CONVERGENCE (HEIGHT)



TEST SITE NO.1, PHALEN MINE

CONVERGENCE (HEIGHT)



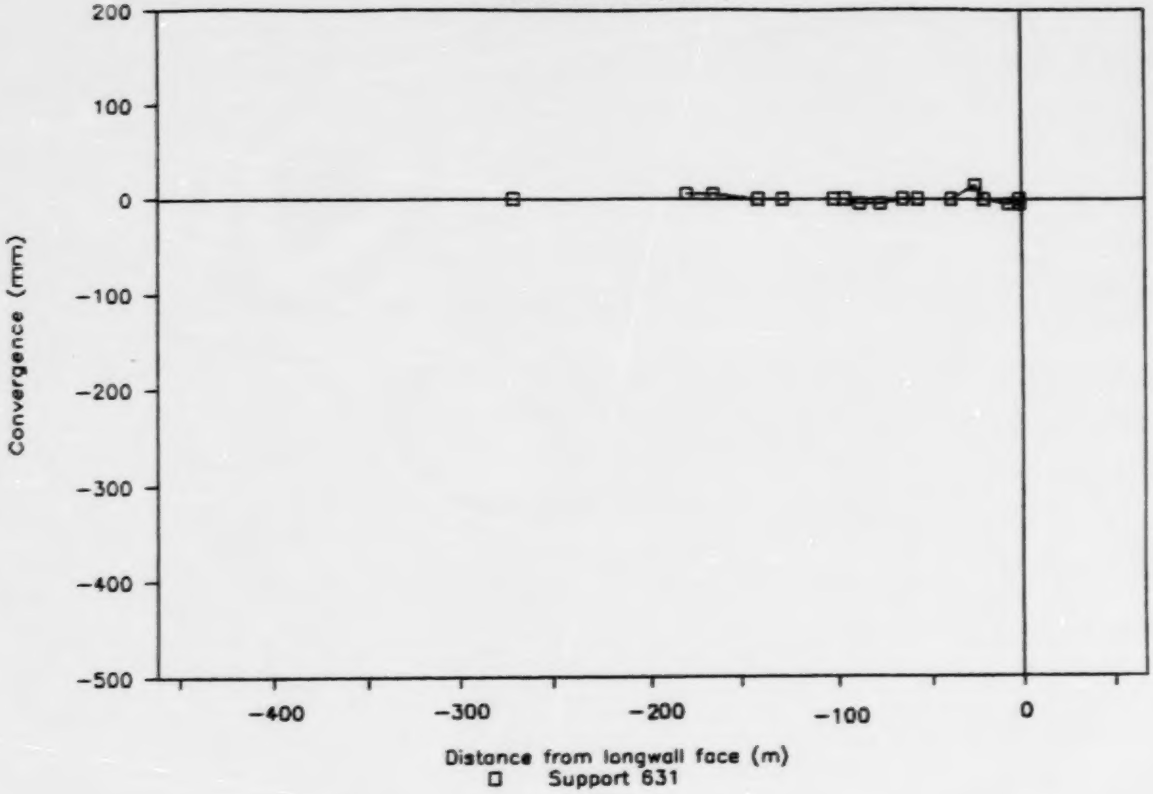


TEST SITE NO.1, PHALEN MINE

CONVERGENCE (HEIGHT)

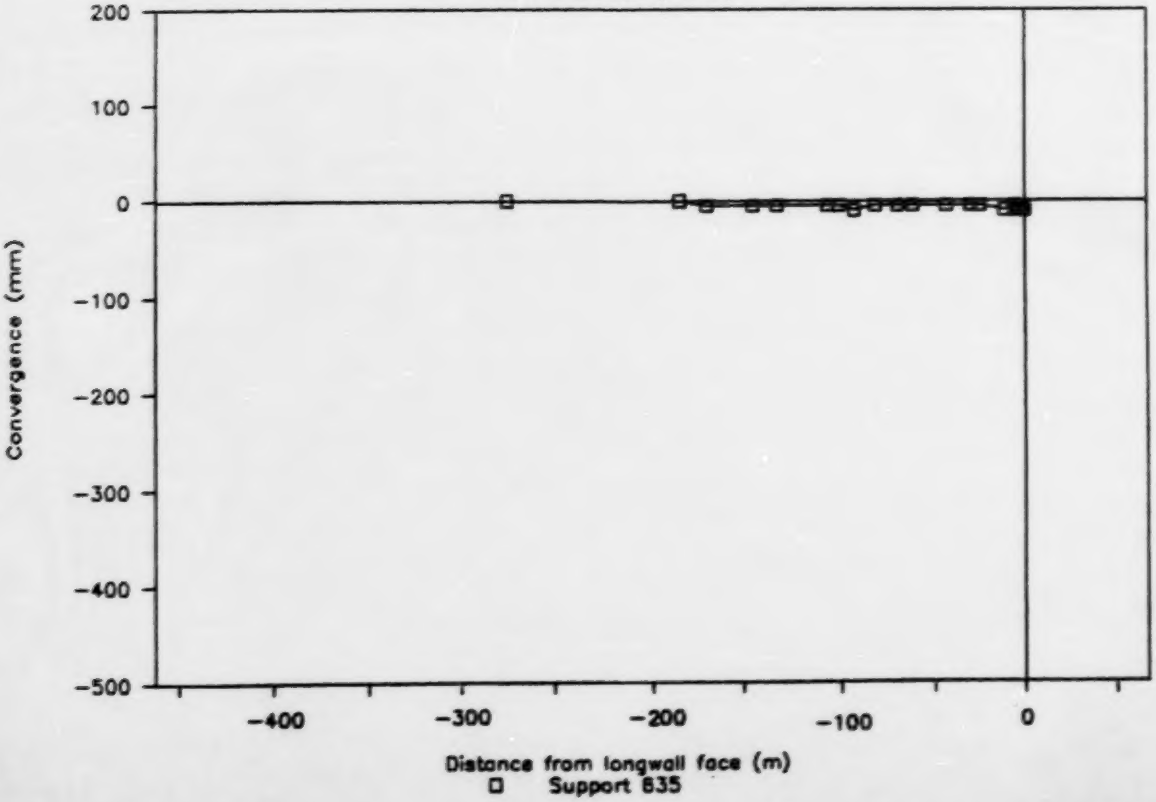
TEST SITE NO.1, PHALEN MINE

CONVERGENCE (WIDTH)



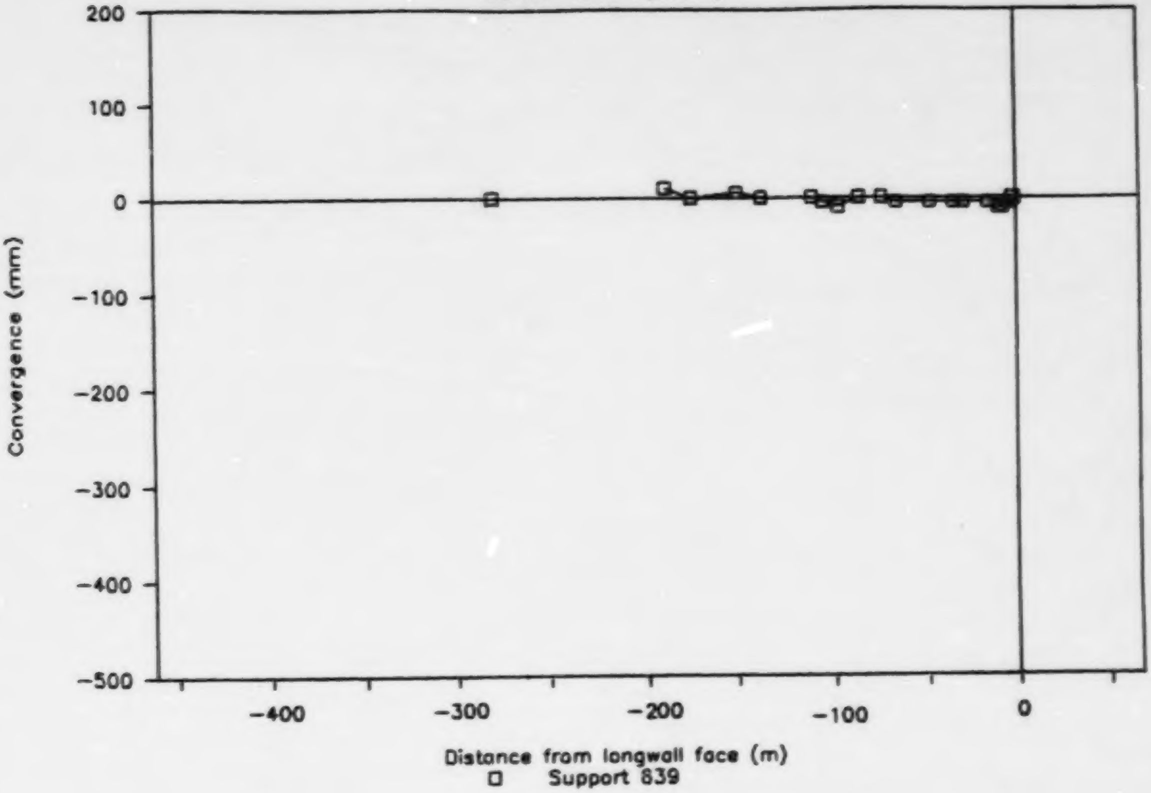
TEST SITE NO.1, PHALEN MINE

CONVERGENCE (WIDTH)



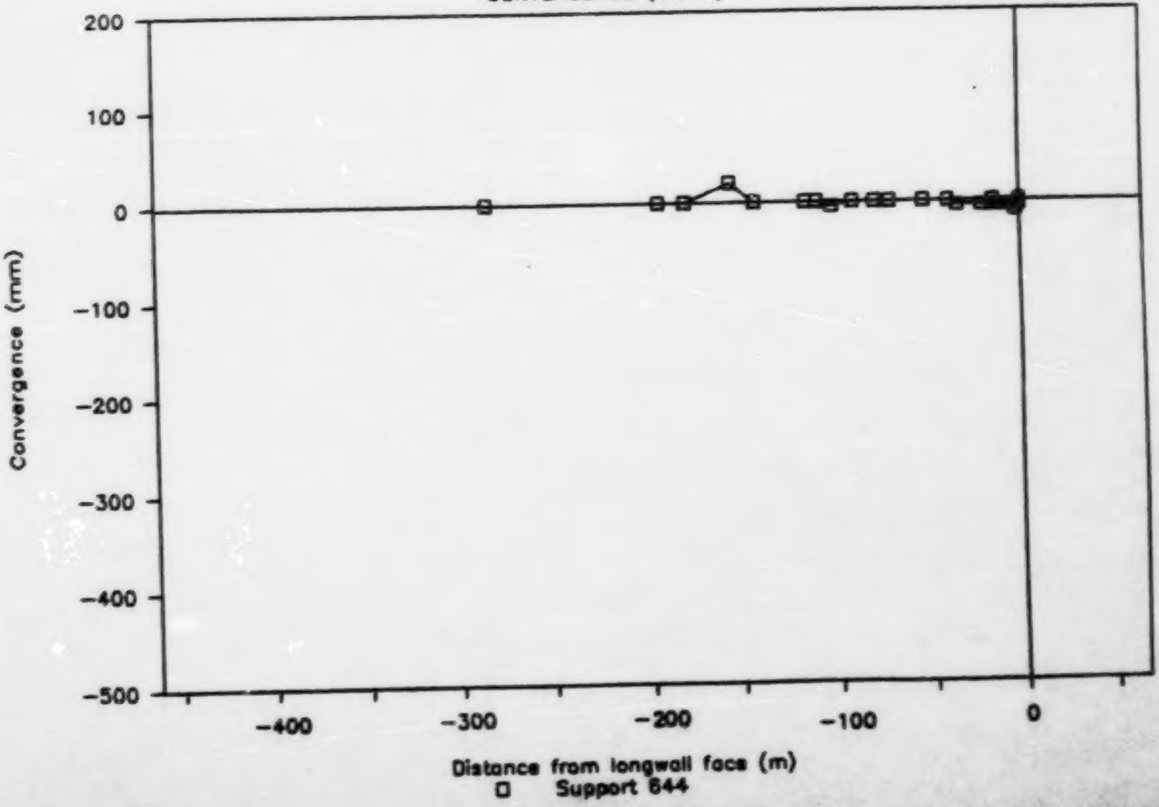
TEST SITE NO.1, PHALEN MINE

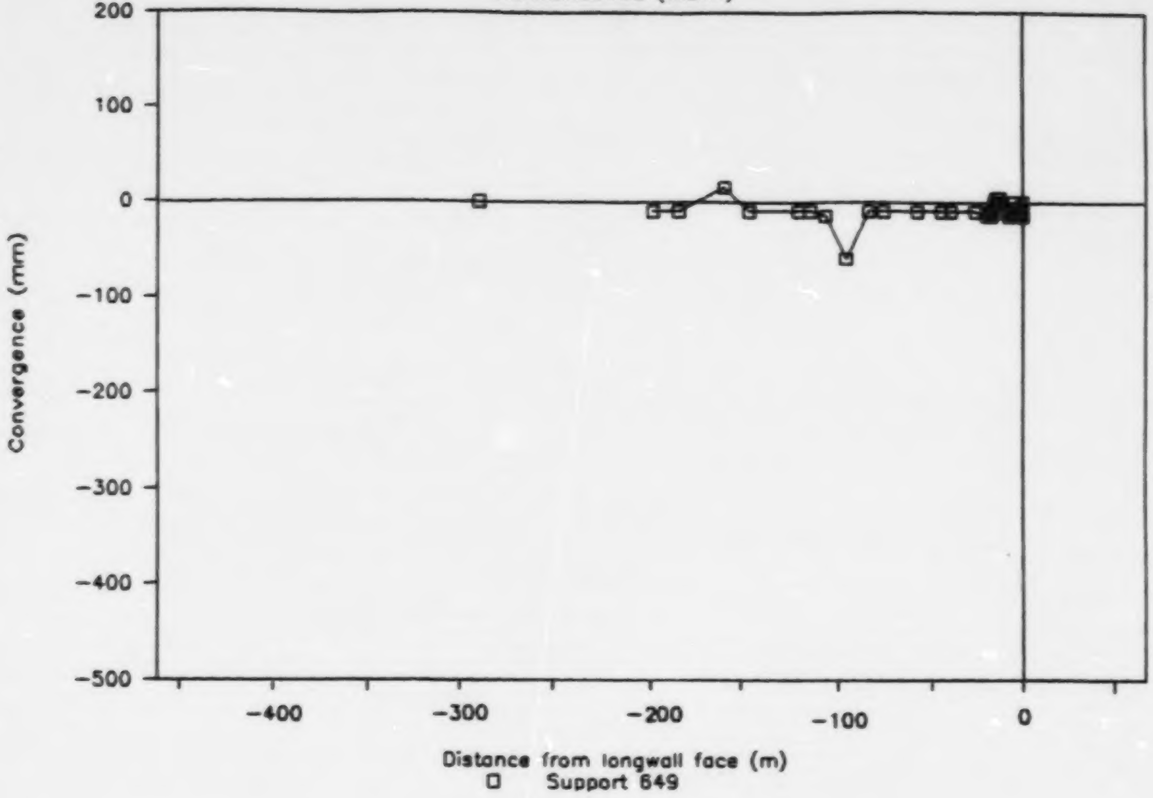
CONVERGENCE (WIDTH)



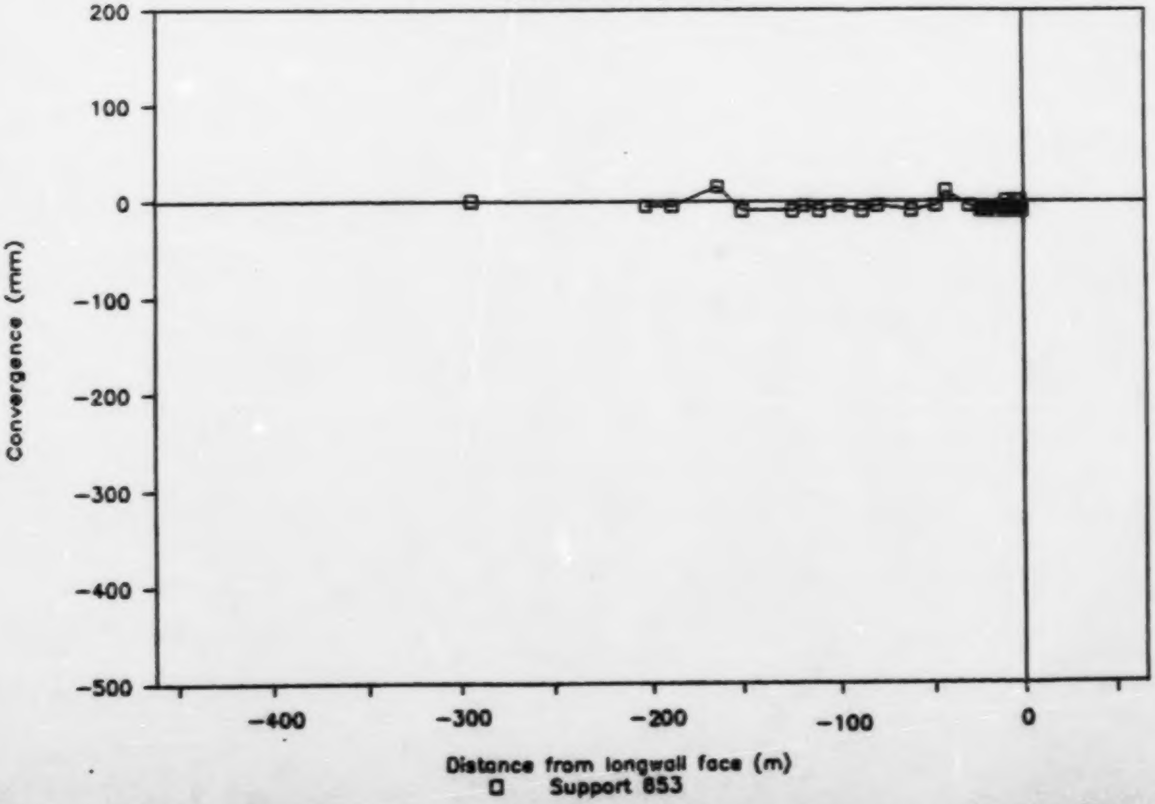
TEST SITE NO.1, PHALEN MINE

CONVERGENCE (WIDTH)

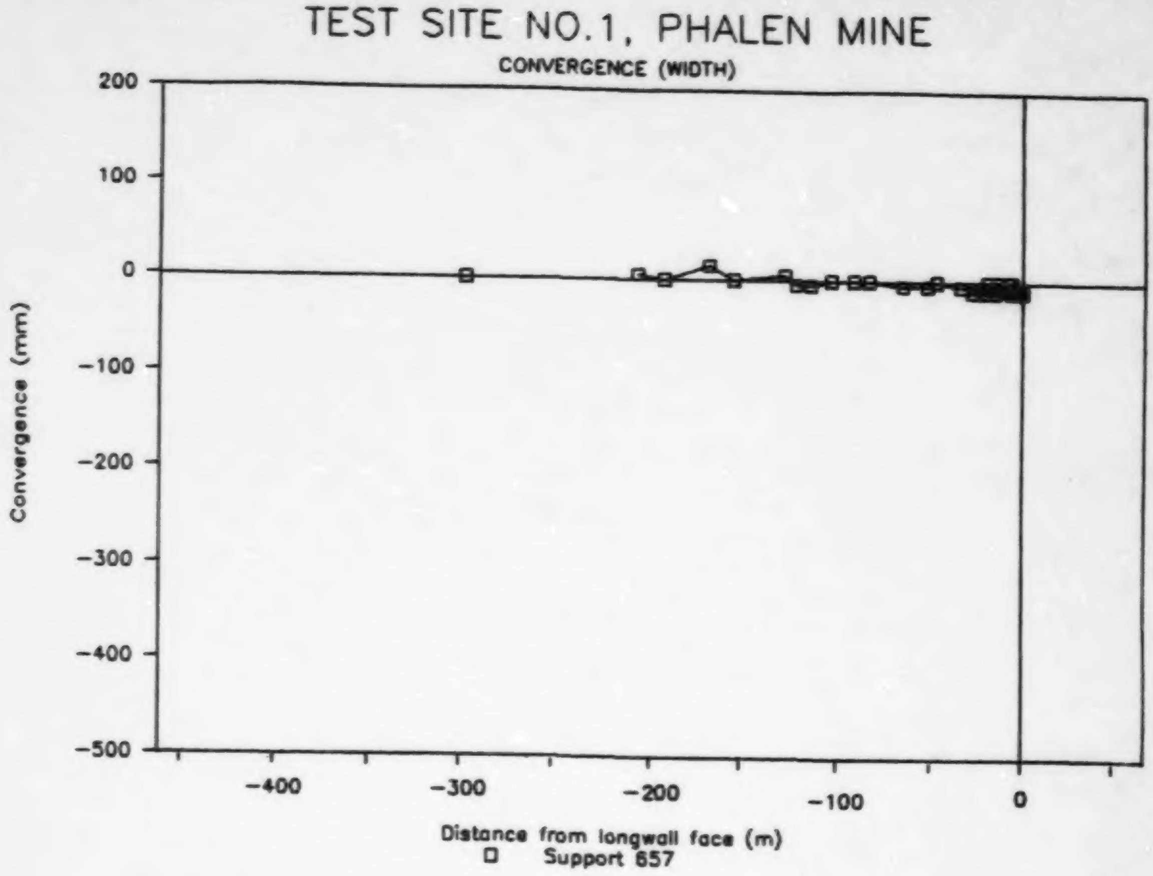


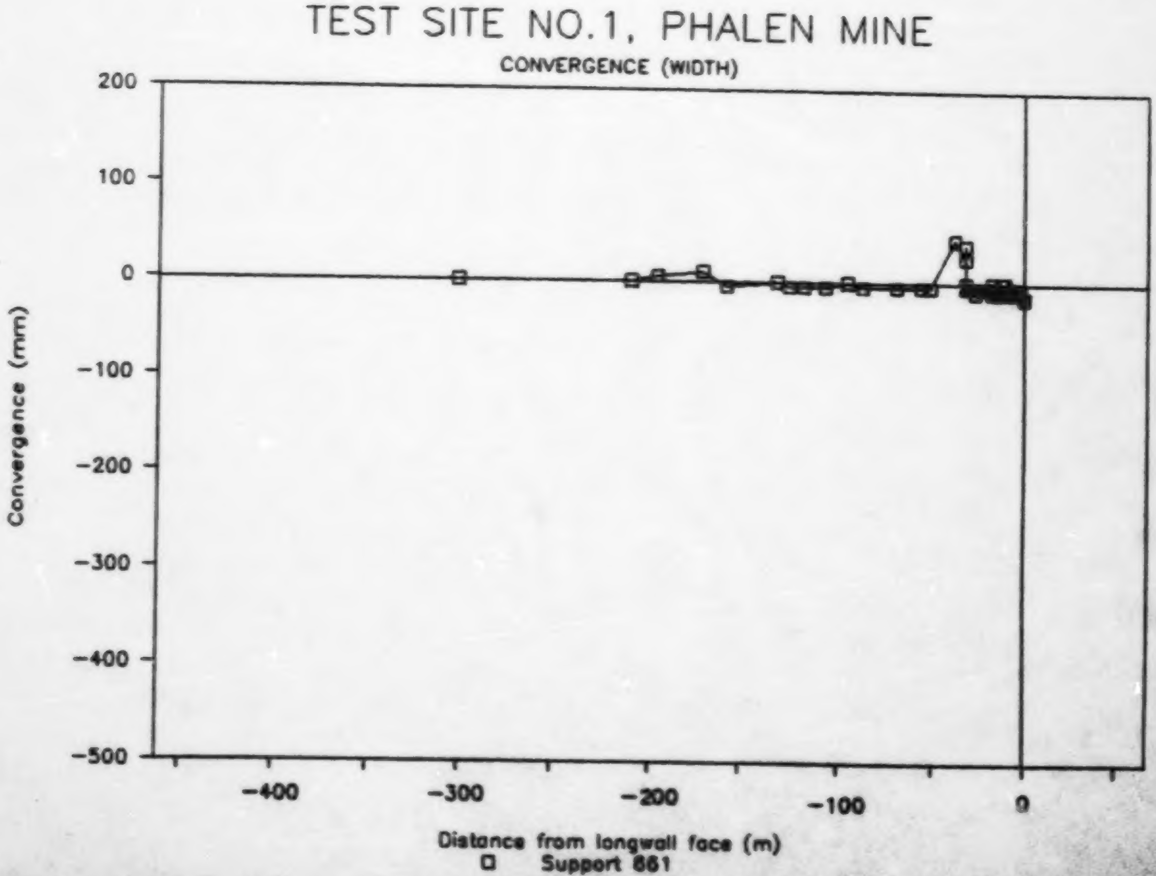

TEST SITE NO.1, PHALEN MINE

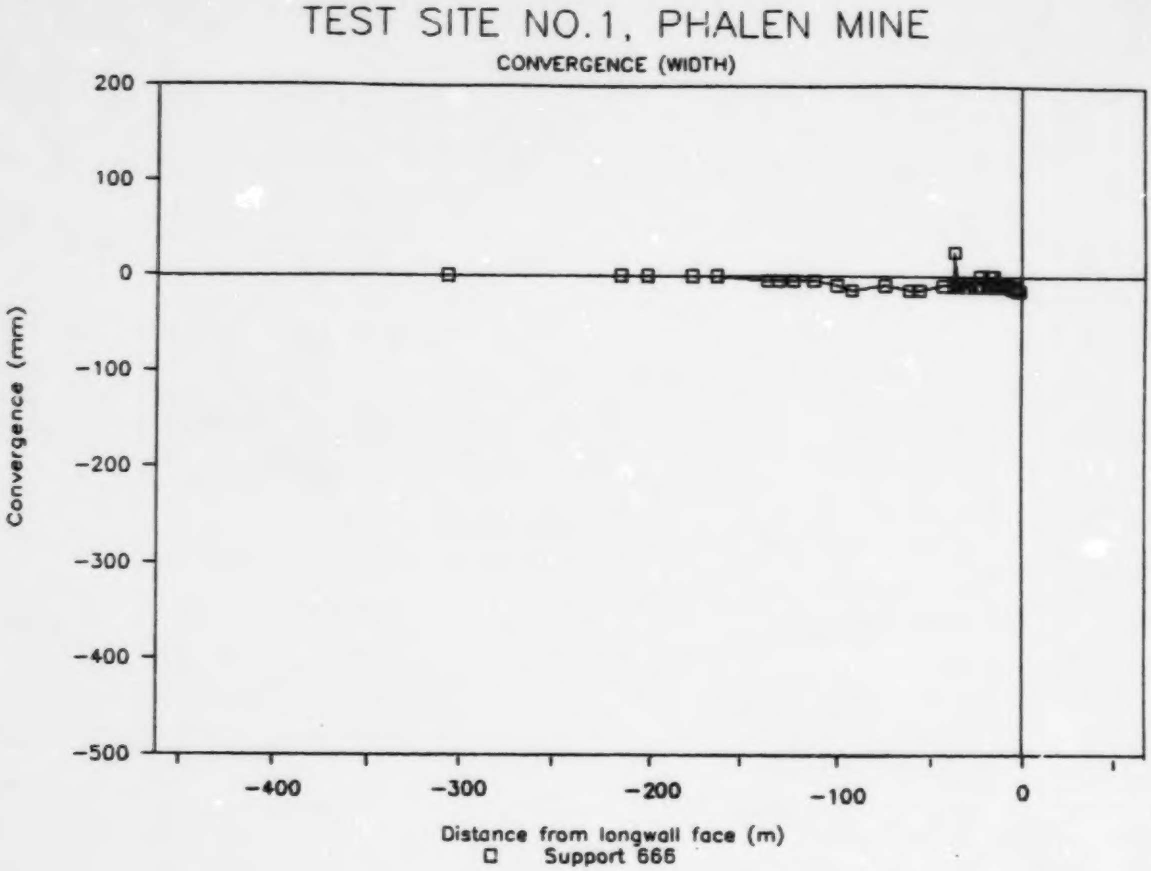
CONVERGENCE (WIDTH)


TEST SITE NO.1, PHALEN MINE

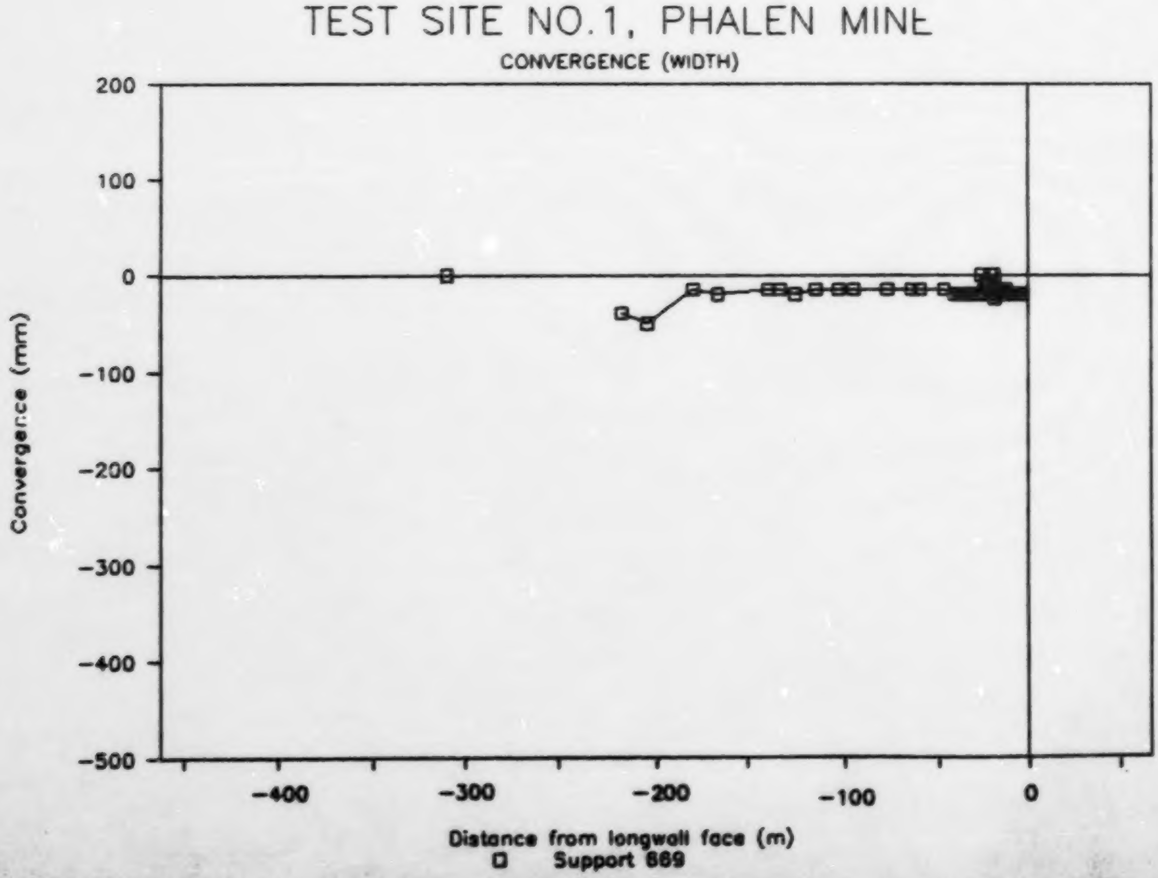
CONVERGENCE (WIDTH)


TEST SITE NO.1, PHALEN MINE
CONVERGENCE (WIDTH)
Convergence (mm)
200
100
0
−100
−200
−300
−400
−500
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 657


TEST SITE NO.1, PHALEN MINE
CONVERGENCE (WIDTH)
Convergence (mm)
200
100
0
−100
−200
−300
−400
−500
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 661


TEST SITE NO.1, PHALEN MINE

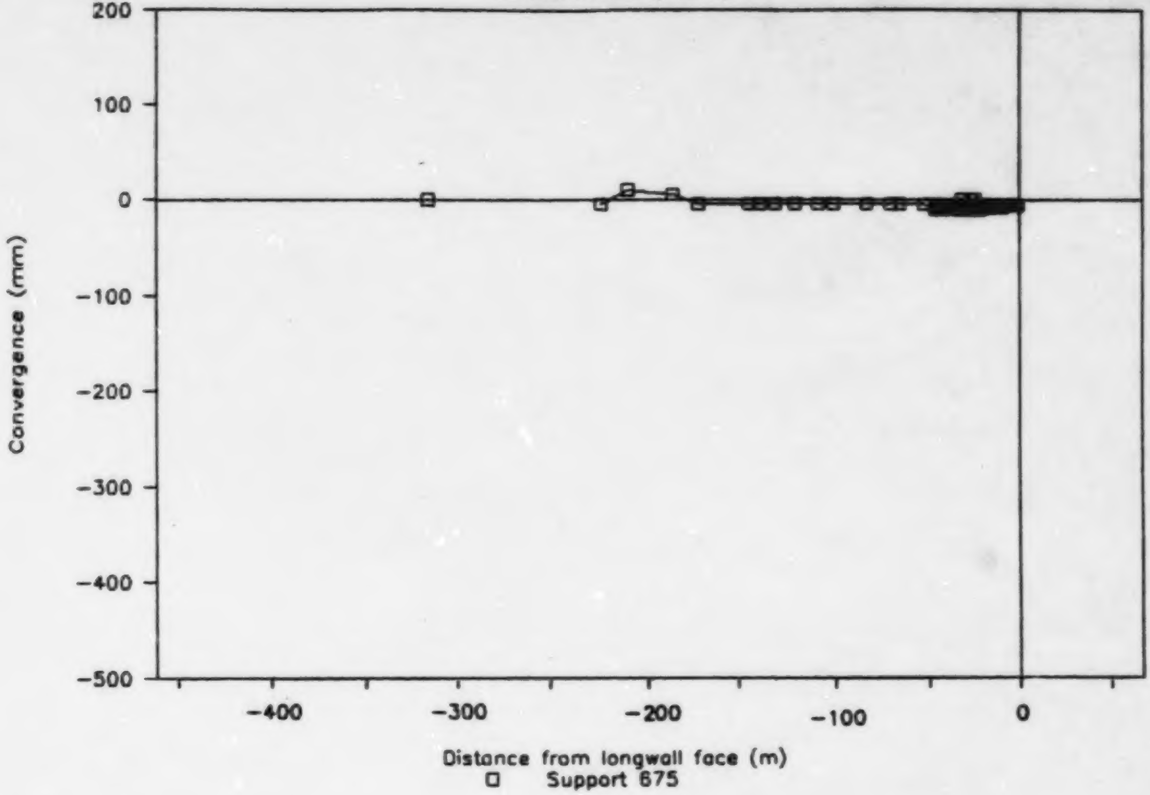
CONVERGENCE (WIDTH)


TEST SITE NO.1, PHALEN MINE

CONVERGENCE (WIDTH)

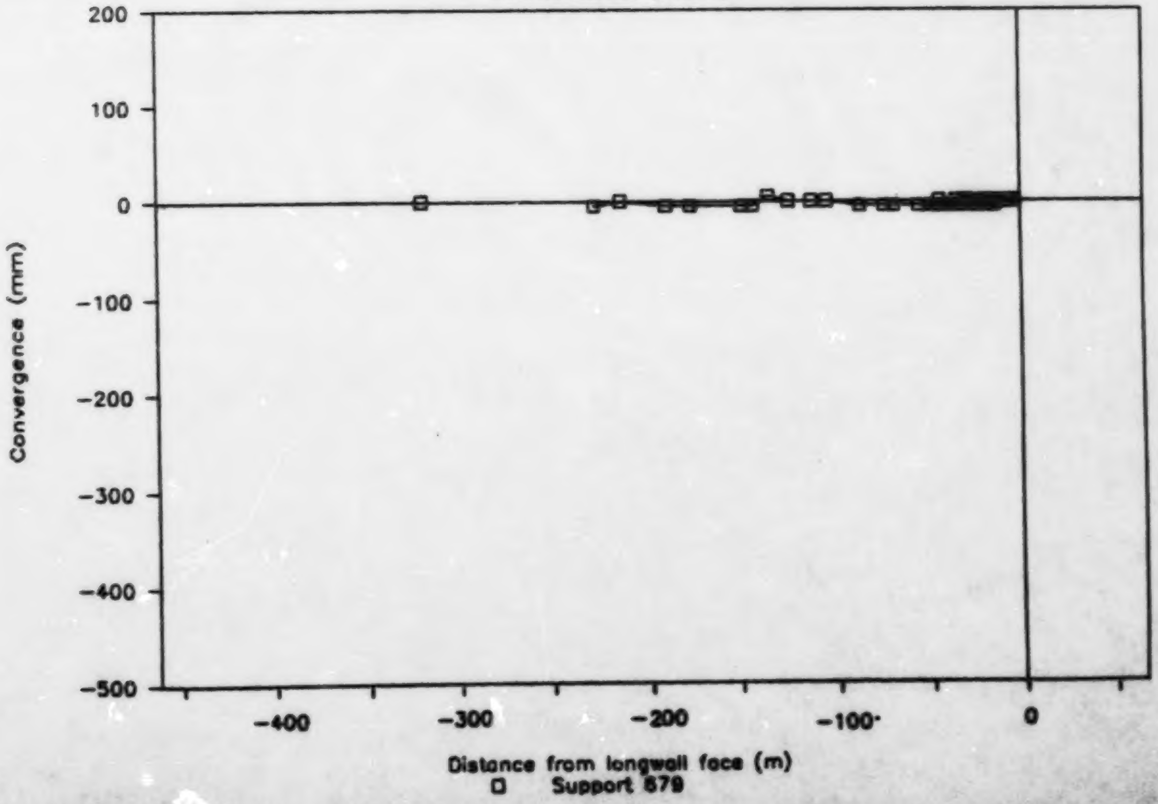
TEST SITE NO.1, PHALEN MINE

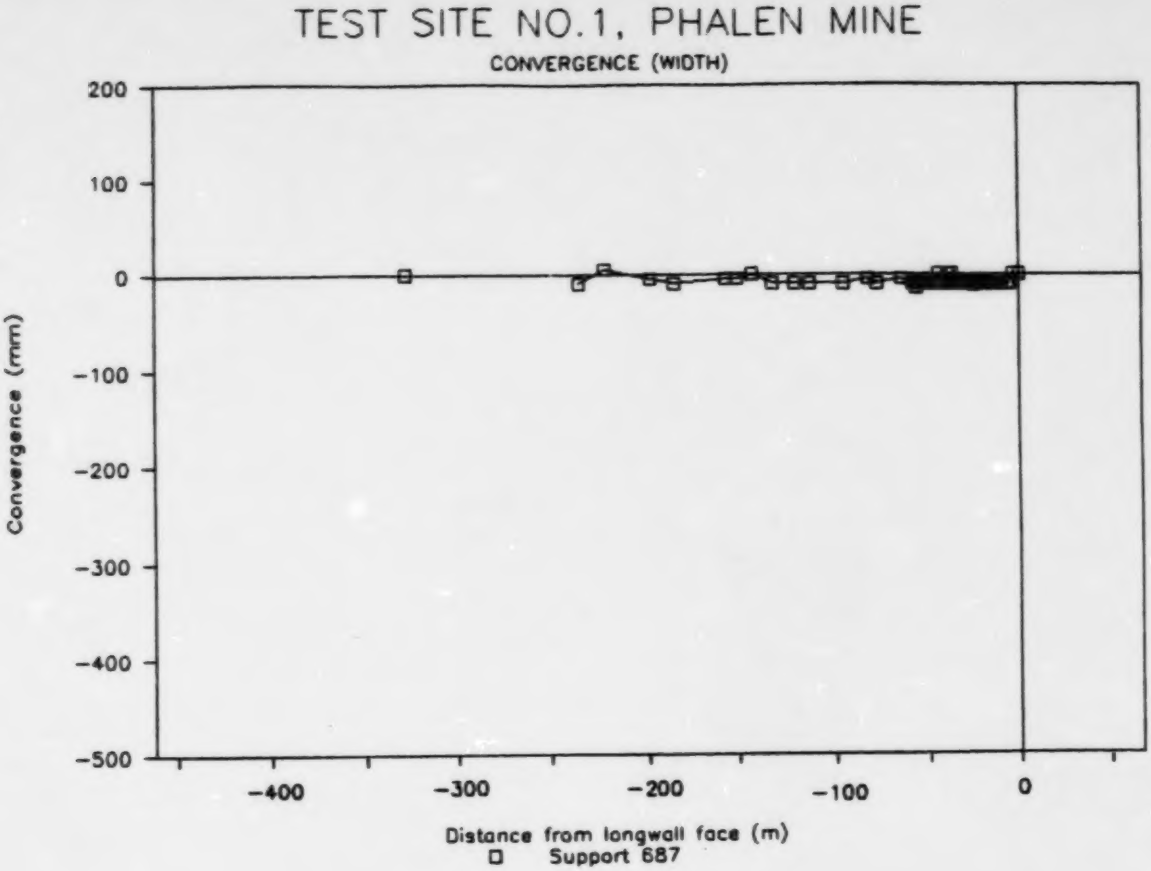
CONVERGENCE (WIDTH)

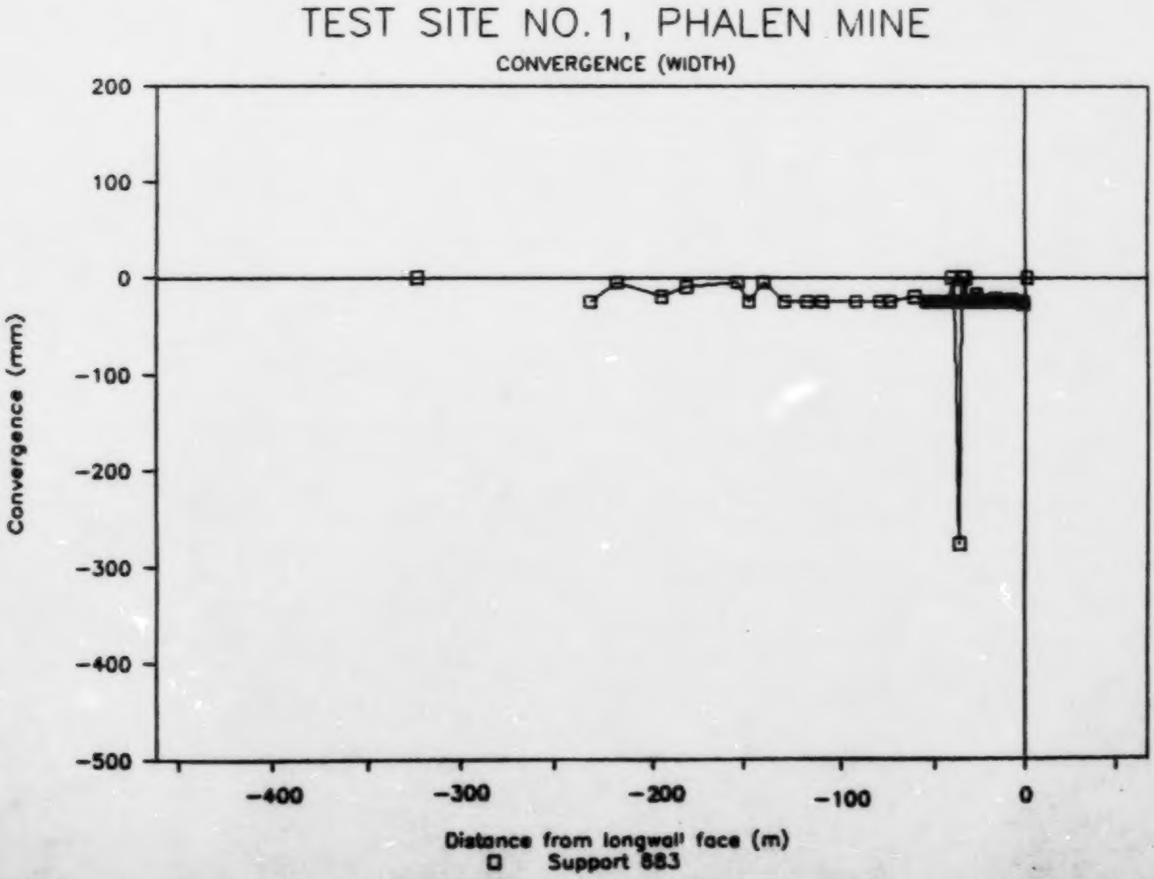


TEST SITE NO.1, PHALEN MINE

CONVERGENCE (WIDTH)

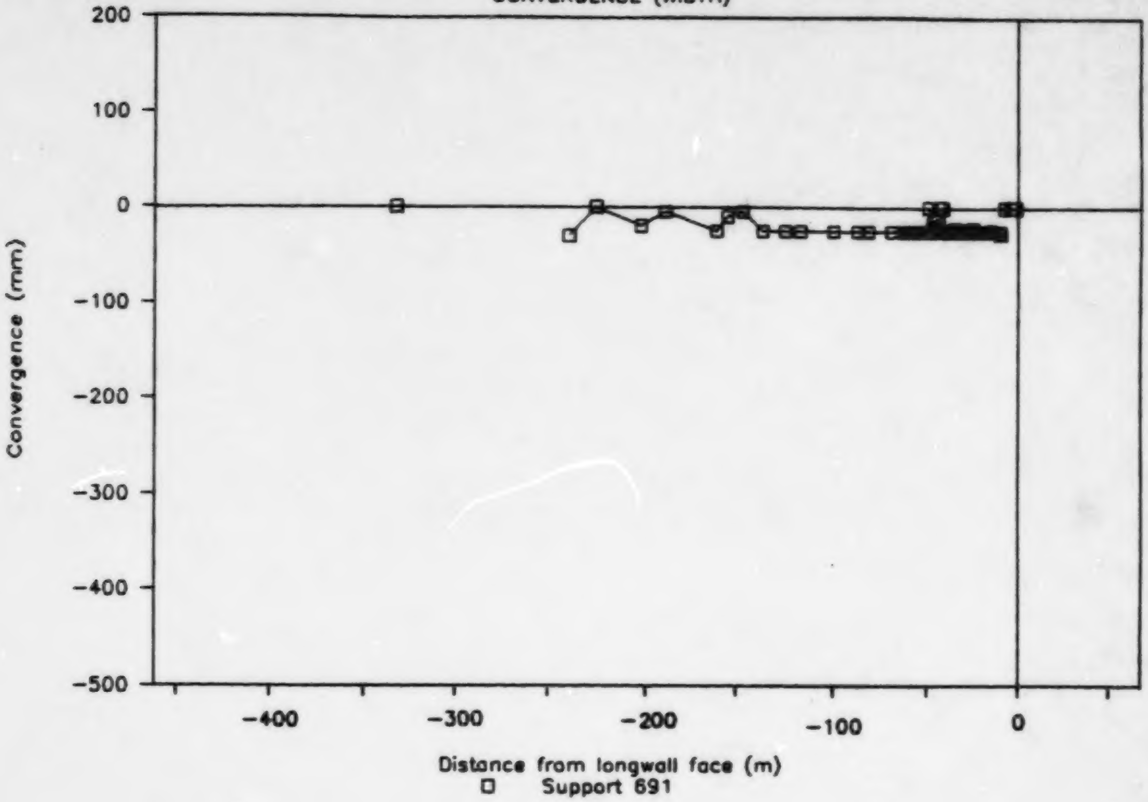



TEST SITE NO.1, PHALEN MINE
CONVERGENCE (WIDTH)
Convergence (mm)
200
100
0
−100
−200
−300
−400
−500
−400
−300
−200
−100
0
Distance from longwall face (m)
Support 687

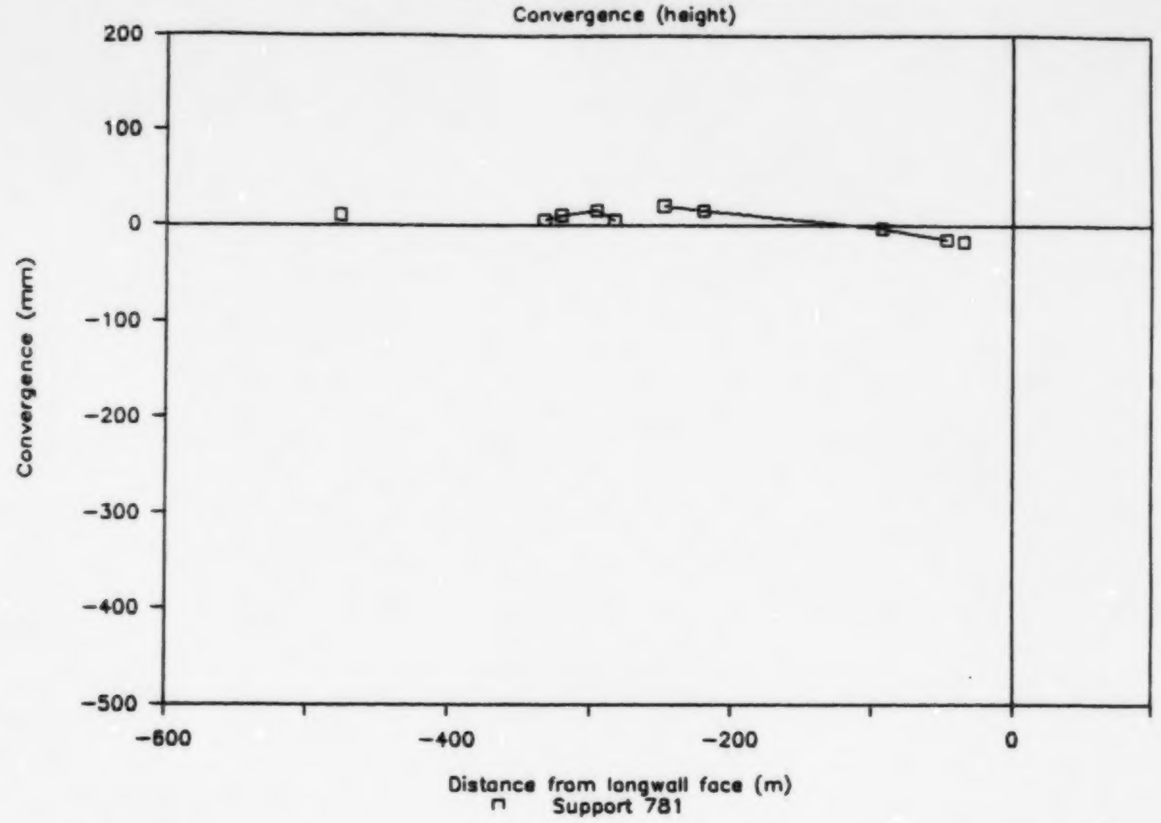

TEST SITE NO.1, PHALEN MINE
CONVERGENCE (WIDTH)
Convergence (mm)
200
100
0
−100
−200
−300
−400
−500
−400
−300
−200
−100
0
Distance from longwall face (m)
Support 883

TEST SITE NO.1, PHALEN MINE

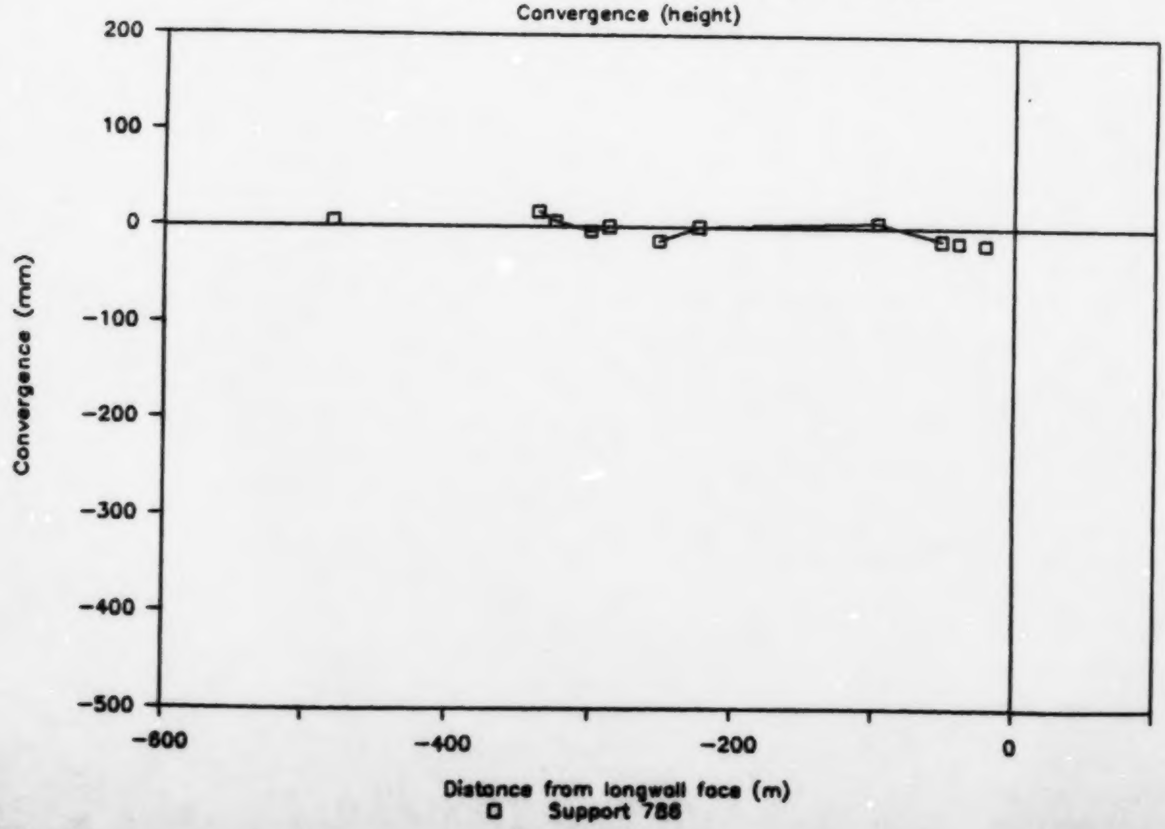
CONVERGENCE (WIDTH)

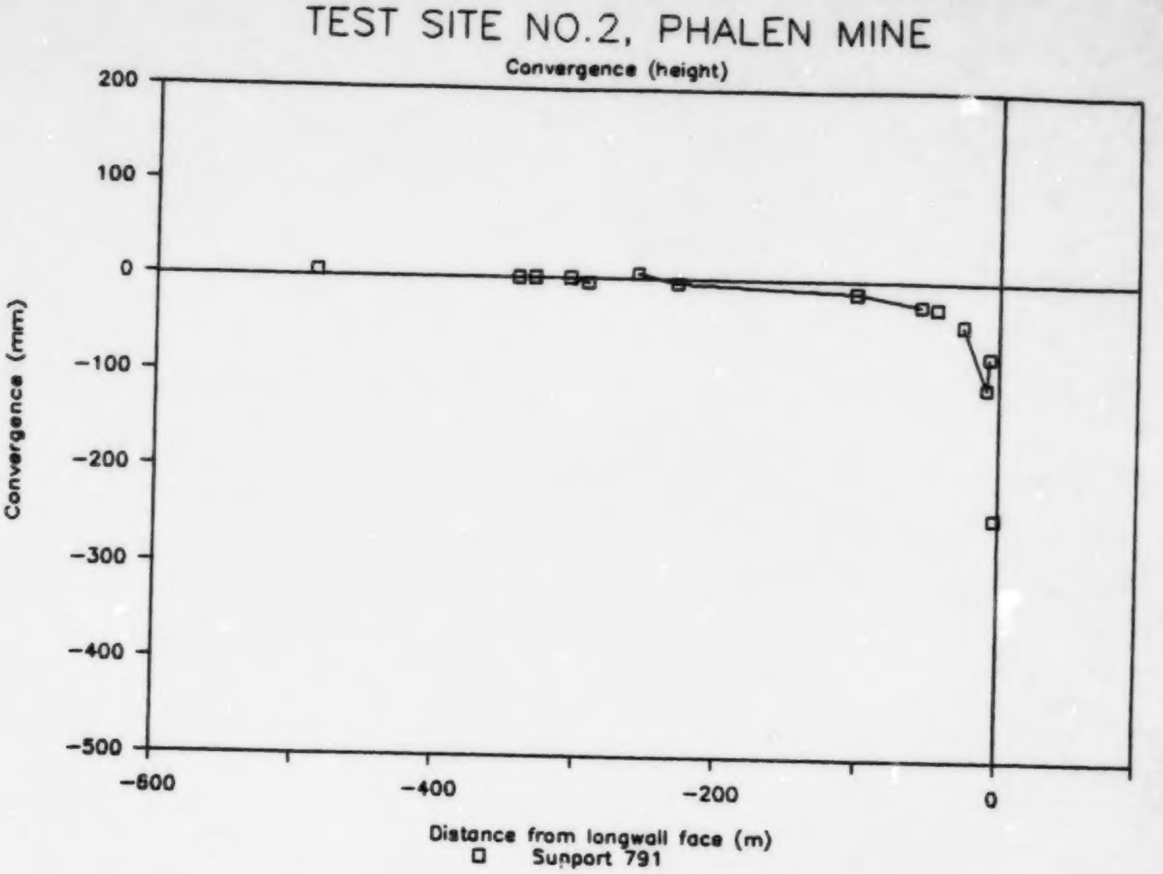


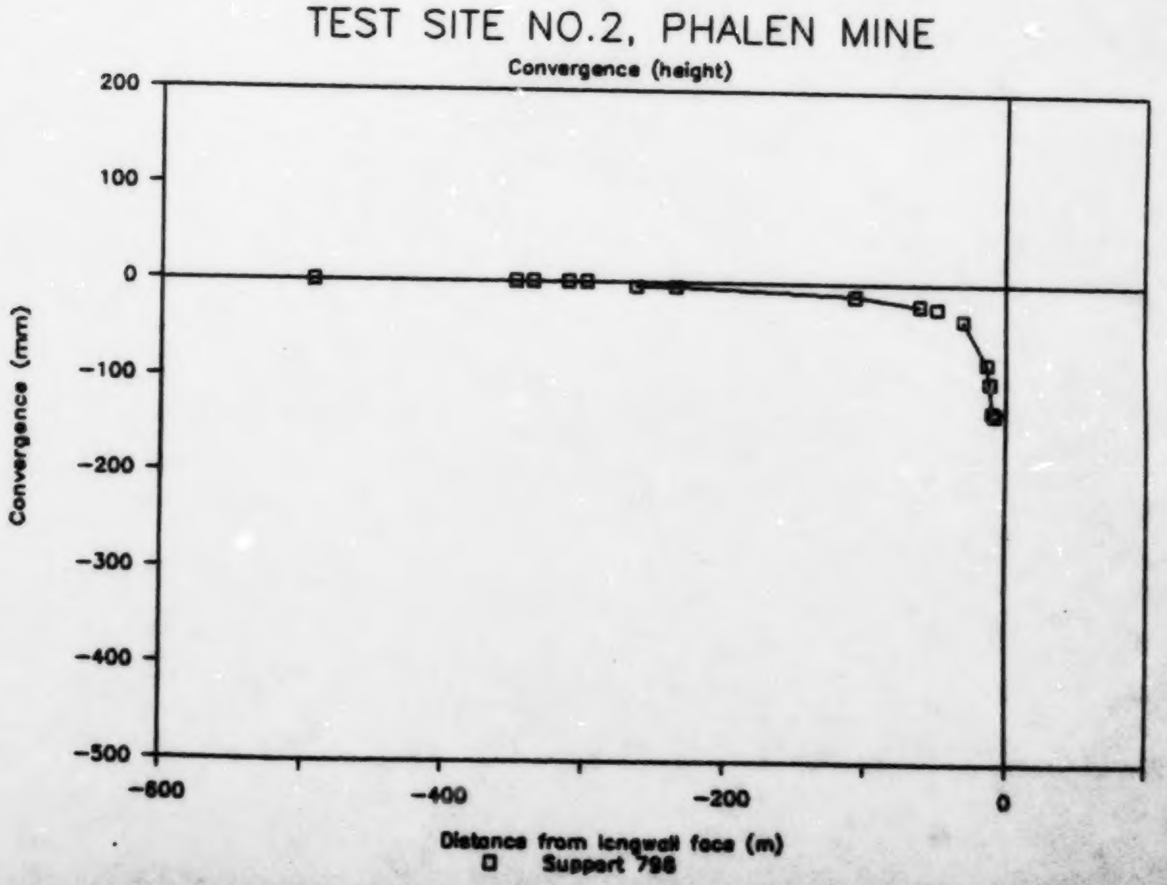
TEST SITE NO.2, PHALEN MINE



TEST SITE NO.2, PHALEN MINE

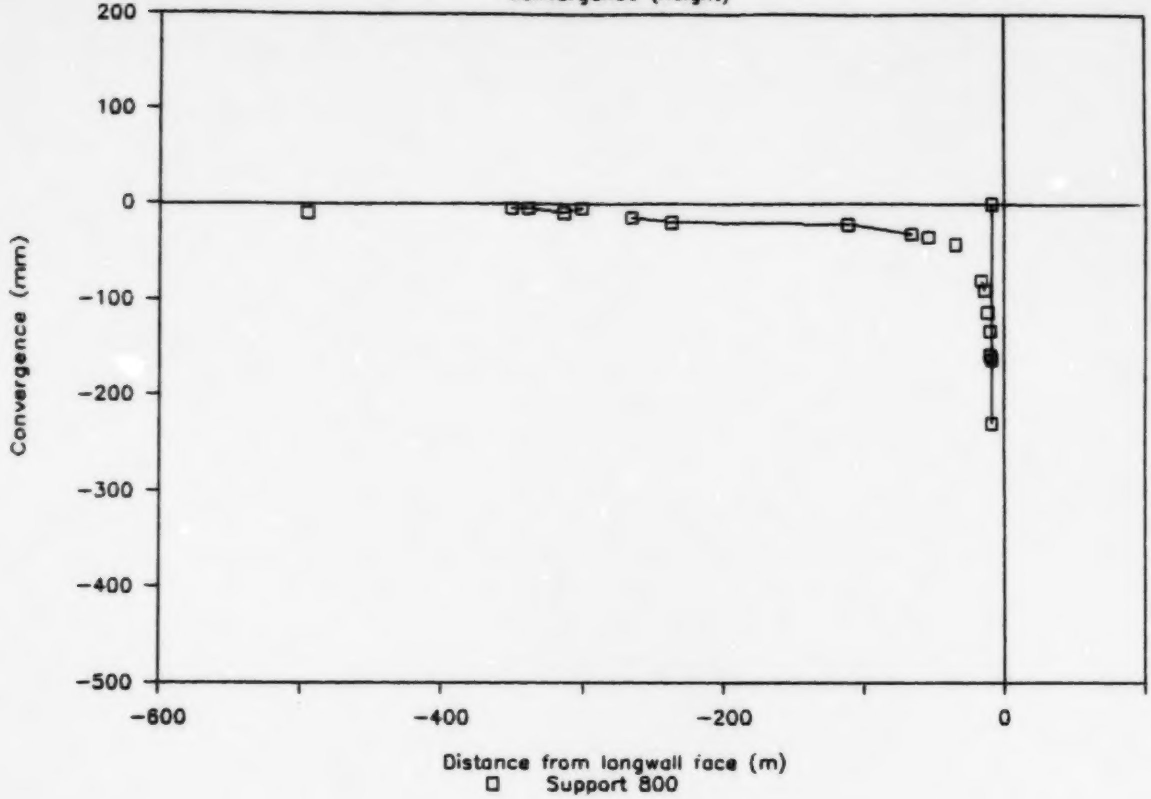



TEST SITE NO.2, PHALEN MINE
Convergence (height)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−600
−400
−200
0
Distance from longwall face (m)
□ Support 791


TEST SITE NO.2, PHALEN MINE
Convergence (height)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−600
−400
−200
0
Distance from longwall face (m)
□ Support 798

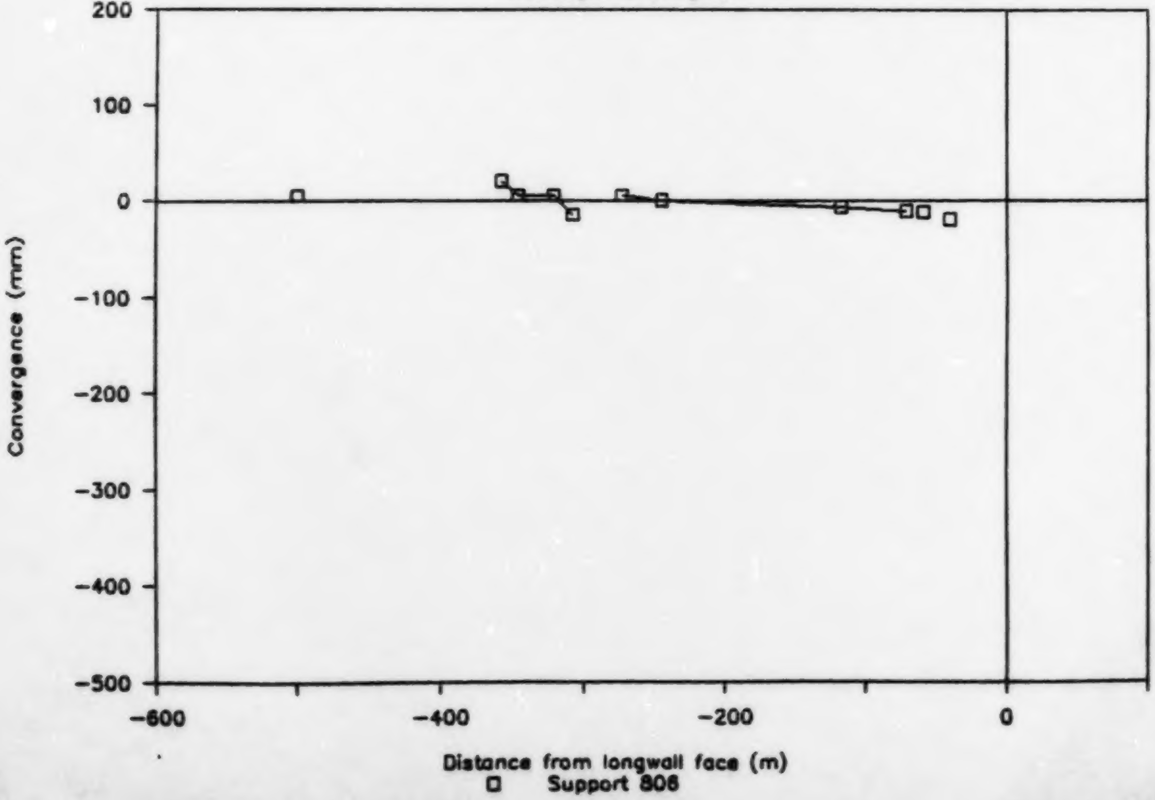
TEST SITE NO.2, PHALEN MINE

Convergence (height)

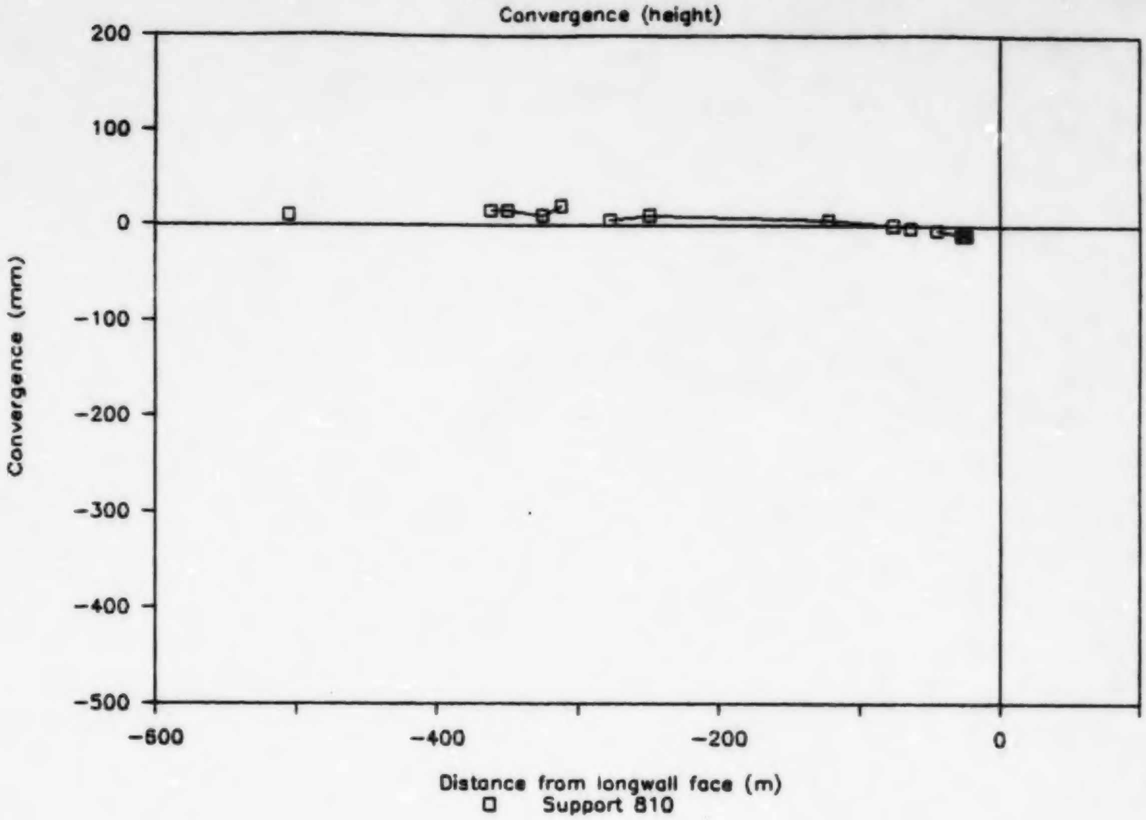


TEST SITE NO.2, PHALEN MINE

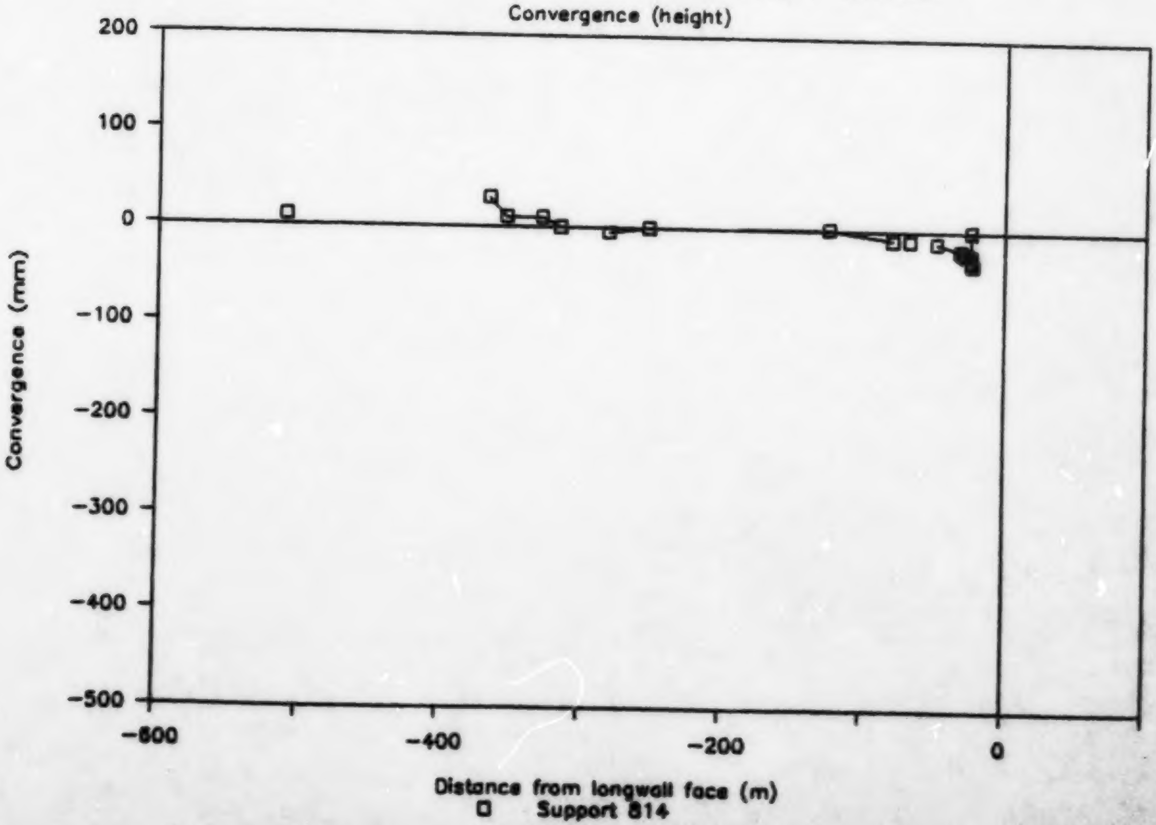
Convergence (height)

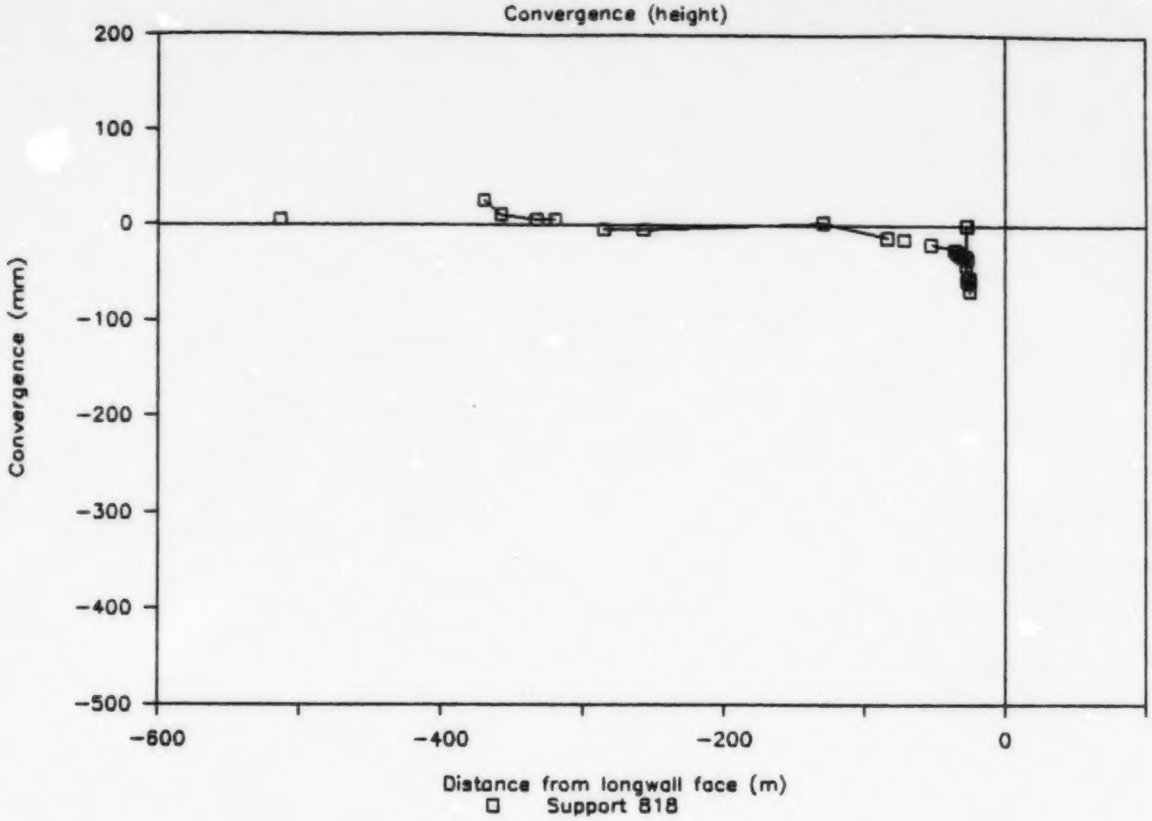


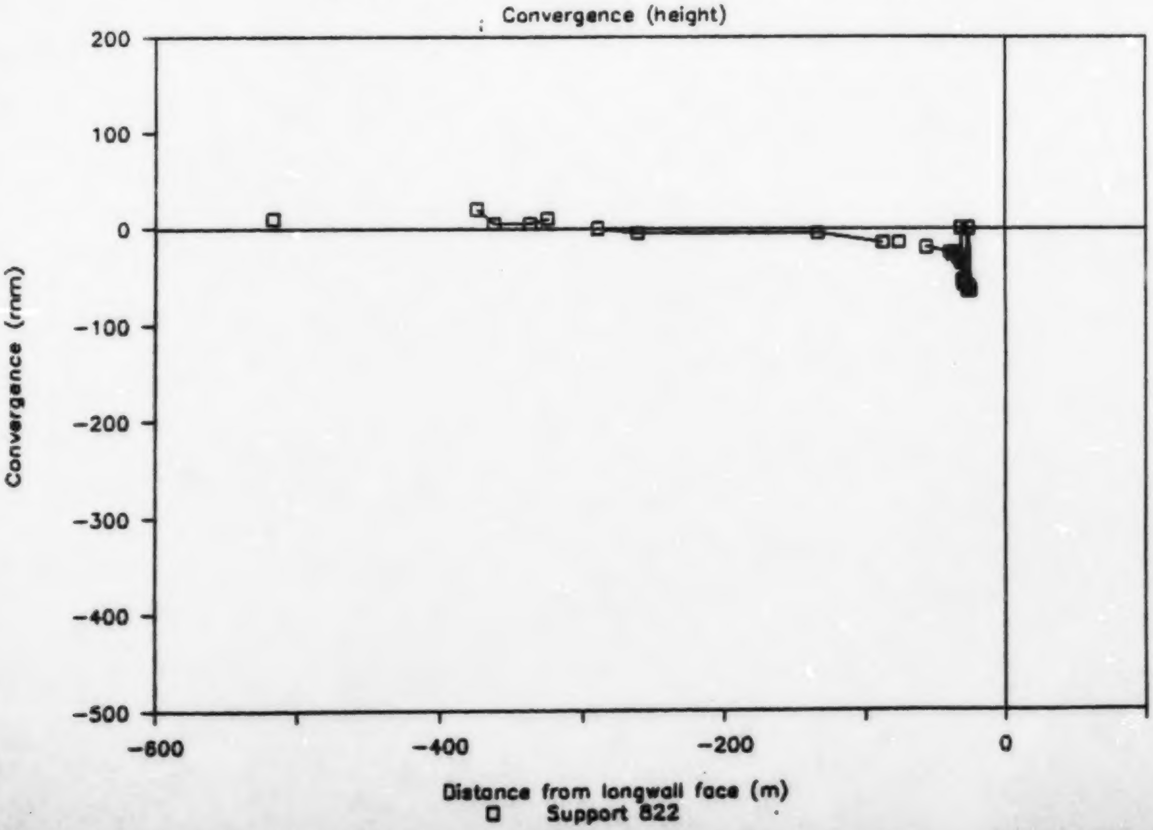
TEST SITE NO.2, PHALEN MINE

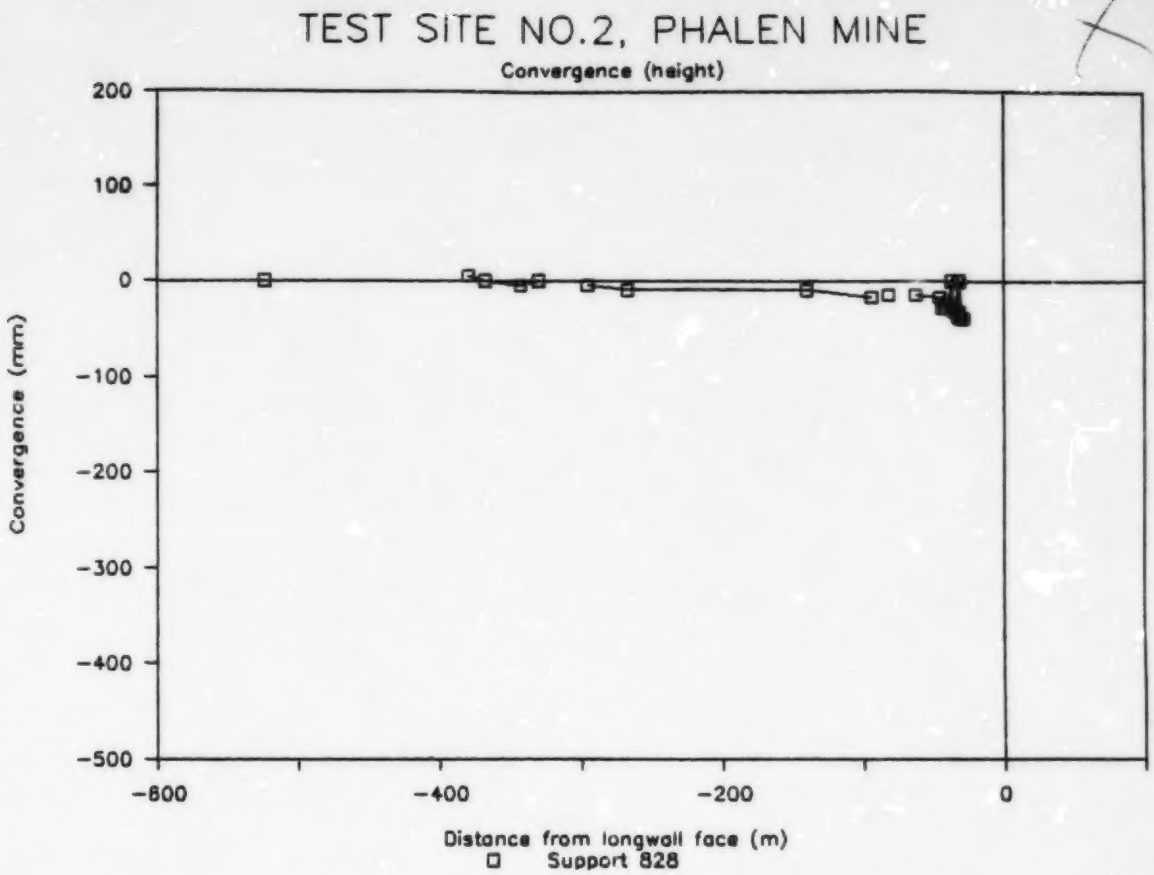


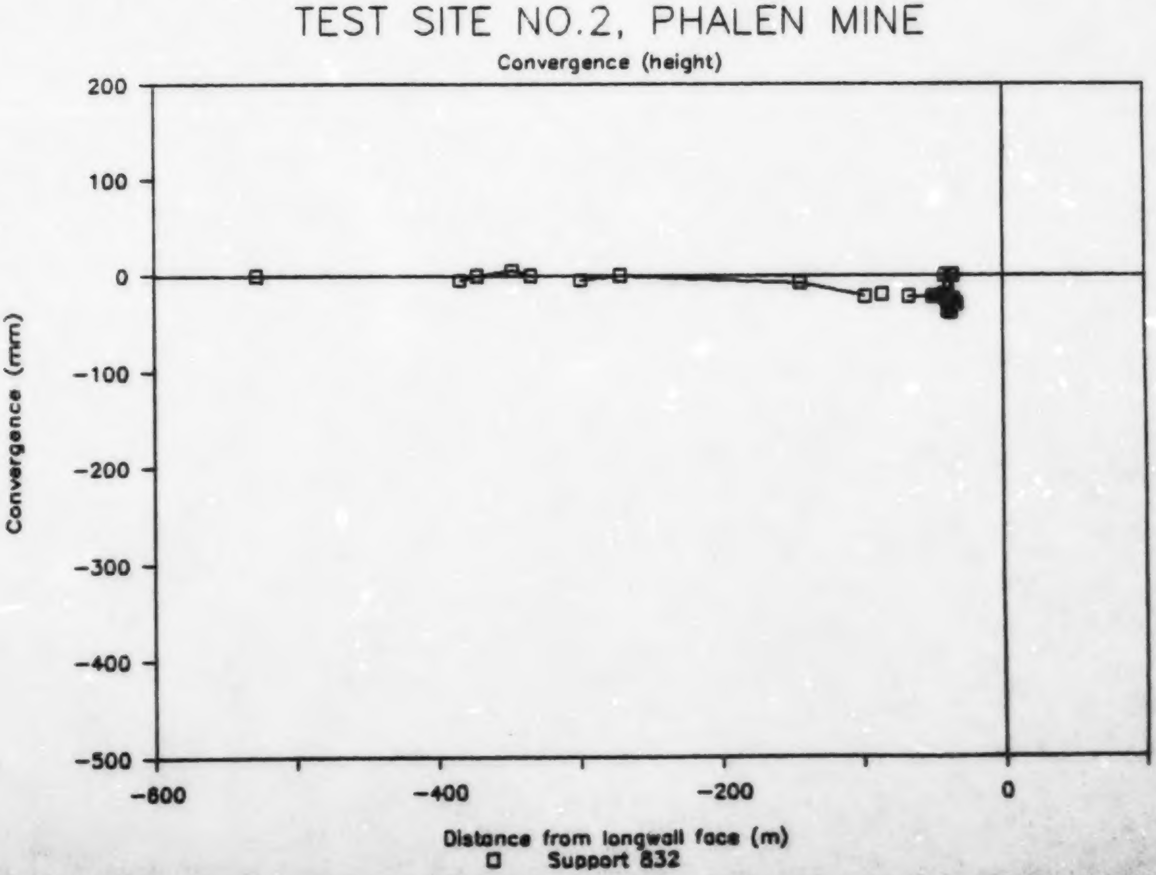
TEST SITE NO.2, PHALEN MINE



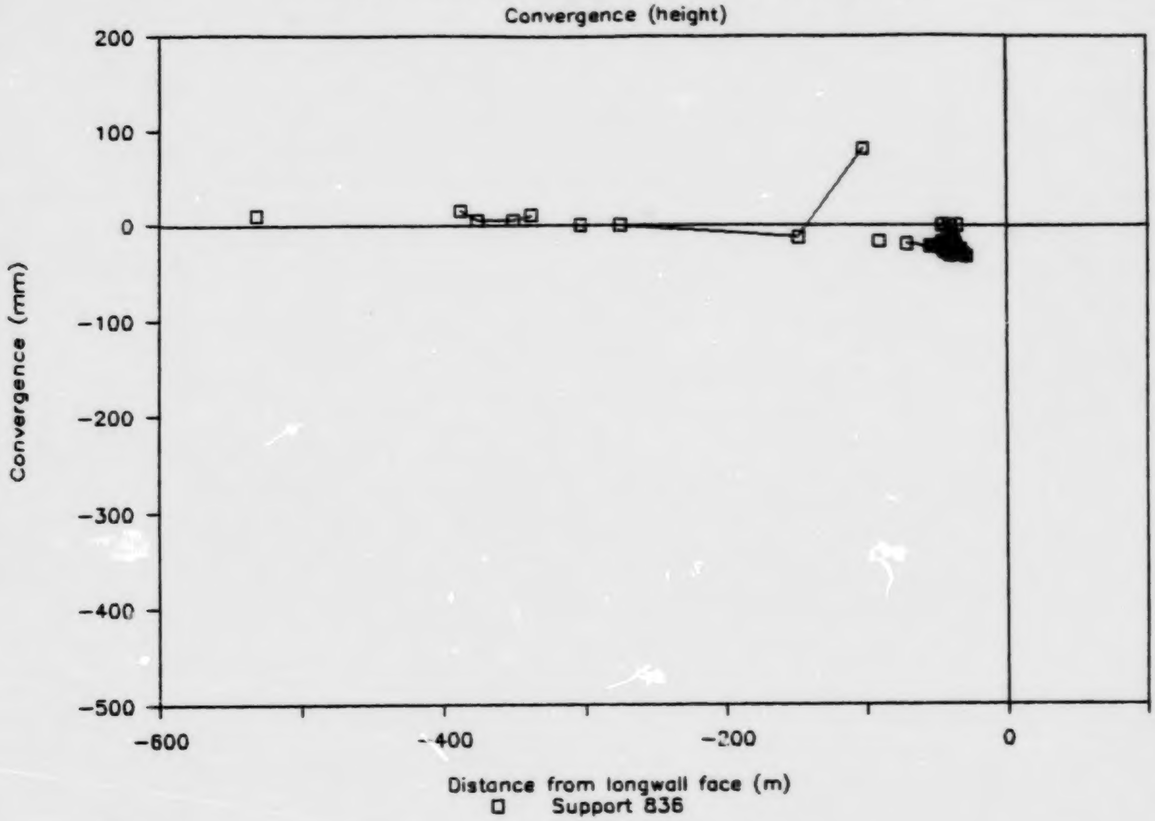

TEST SITE NO.2, PHALEN MINE


TEST SITE NO.2, PHALEN MINE

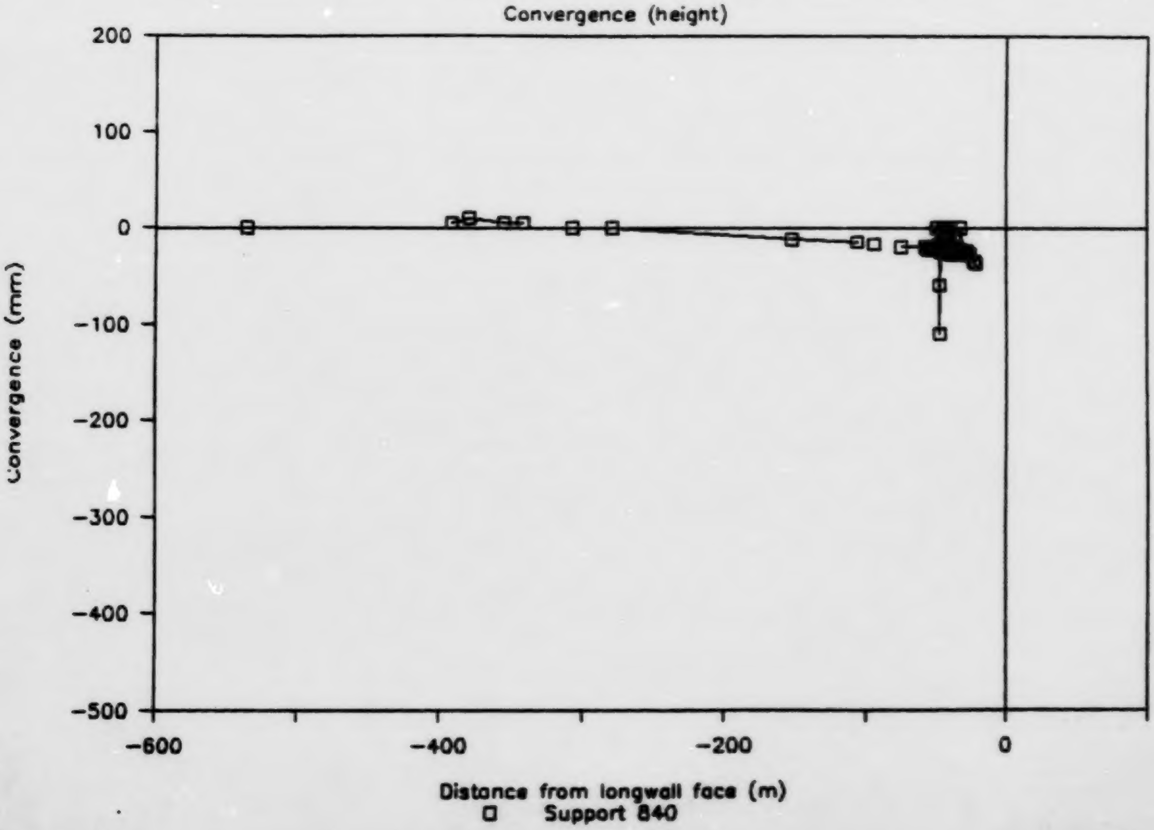

TEST SITE NO.2, PHALEN MINE
Convergence (height)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−800
−400
−200
0
Distance from longwall face (m)
□ Support 828


TEST SITE NO.2, PHALEN MINE
Convergence (height)
200
100
0
−100
−200
−300
−400
−500
Convergence (mm)
−800
−400
−200
0
Distance from longwall face (m)
□ Support 832

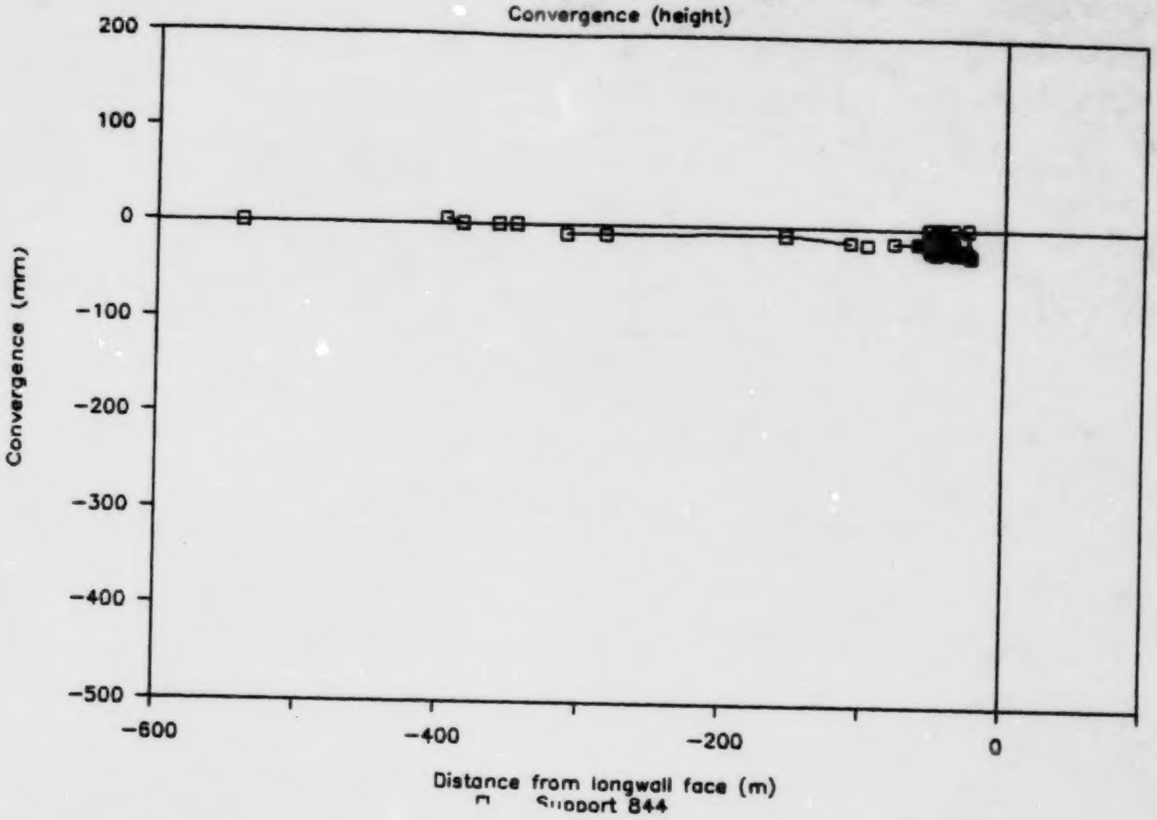
TEST SITE NO.2, PHALEN MINE



TEST SITE NO.2, PHALEN MINE



TEST SITE NO.2, PHALEN MINE



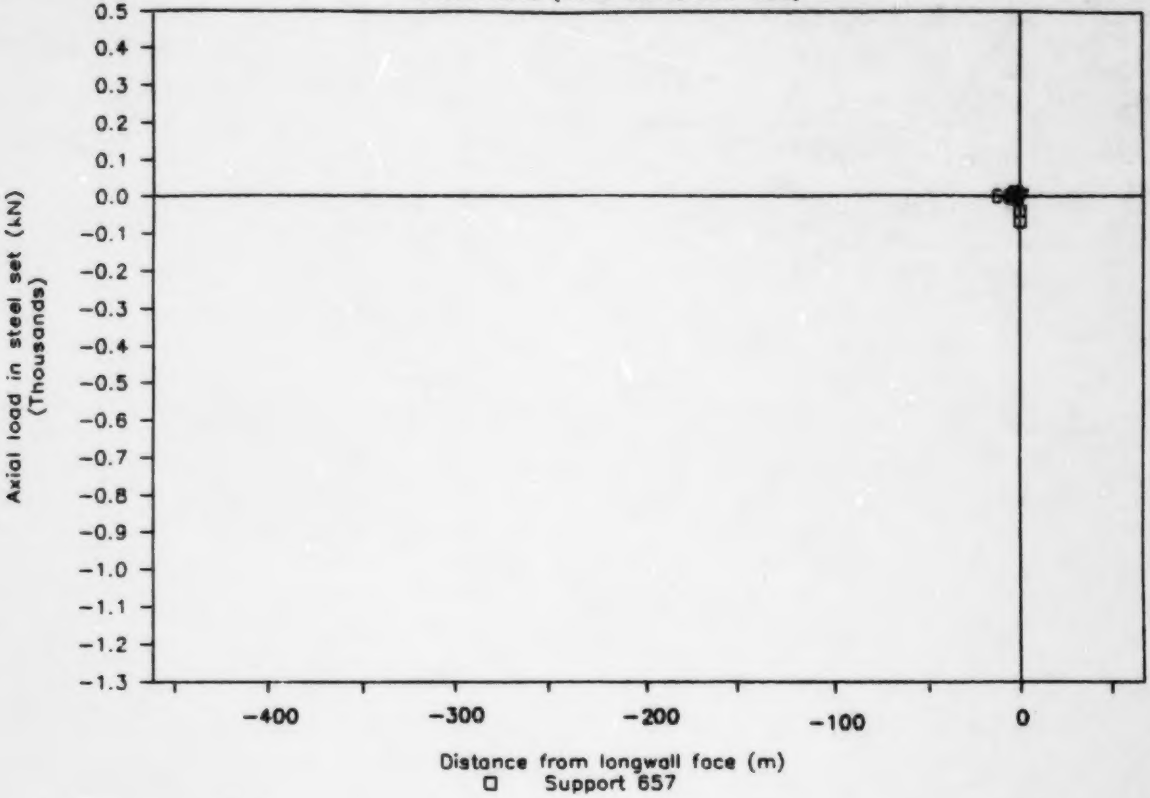
APPENDIX 7

GRAPHS
OF
AXIAL LOAD, BENDING MOMENT AND MAXIMUM STRESS
IN STEEL SETS

TEST SITES NO. 1 AND 2

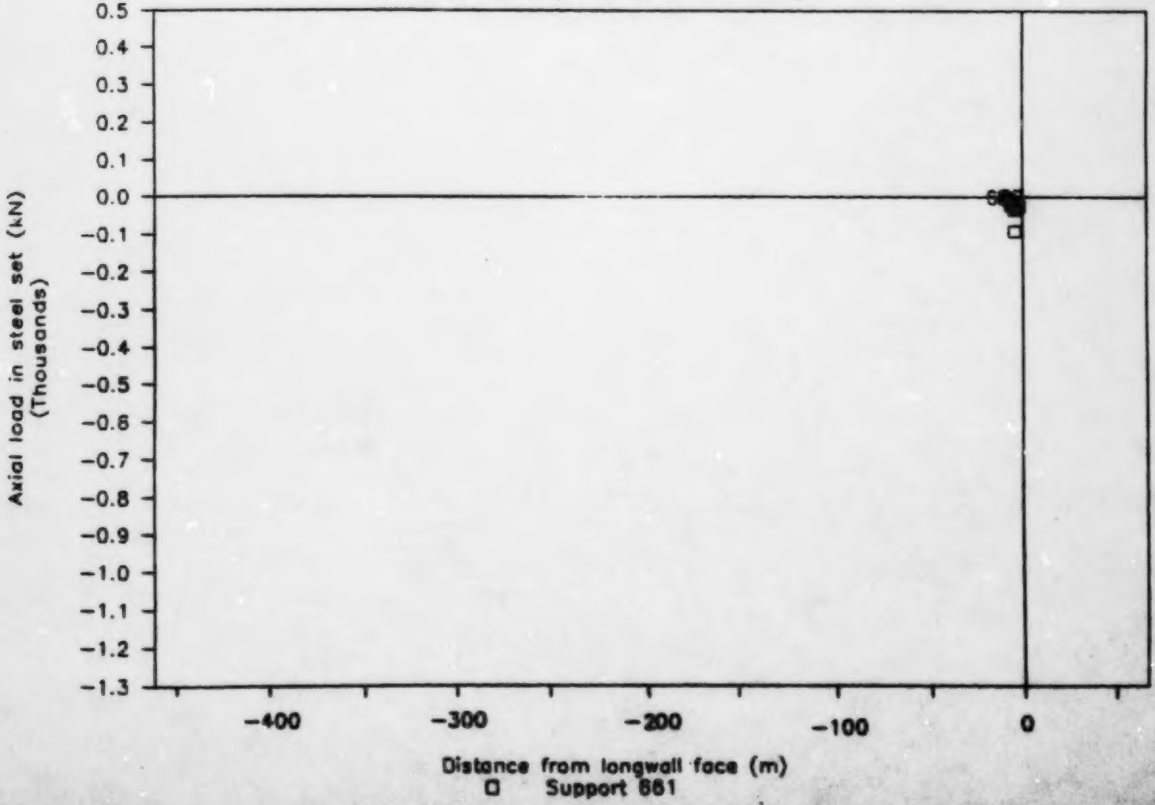
TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)



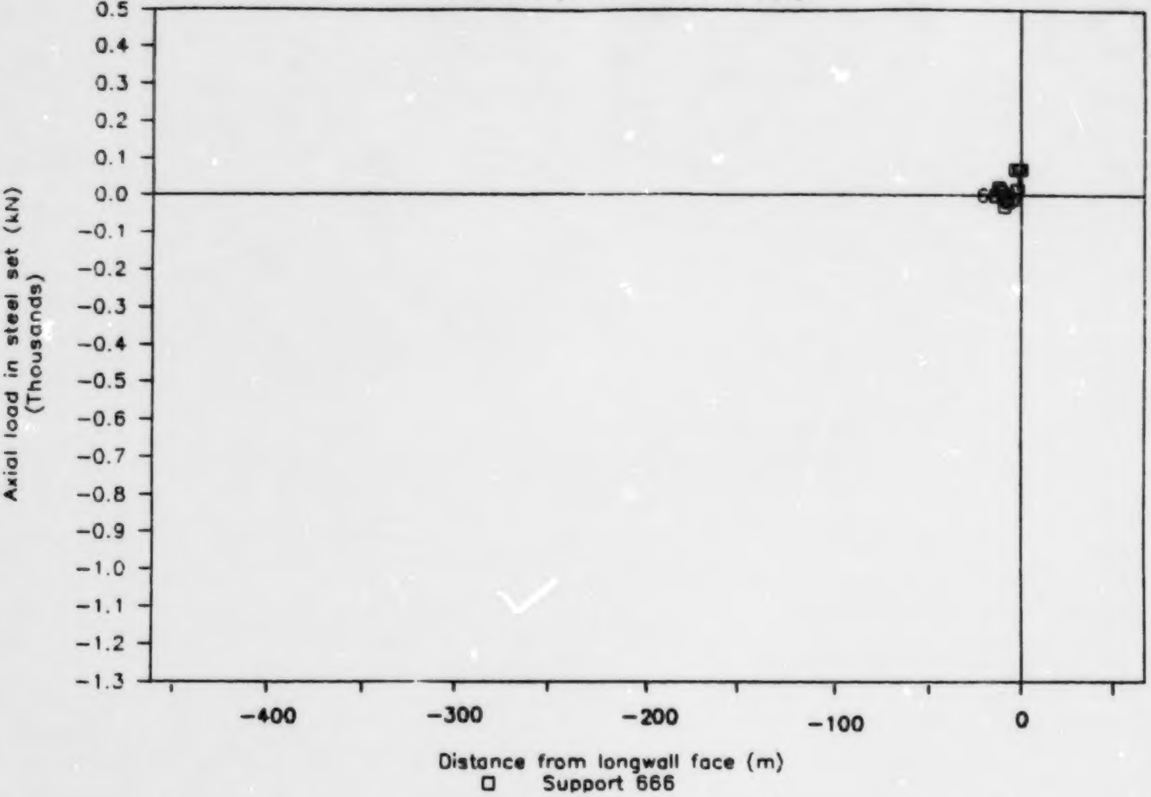
TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)



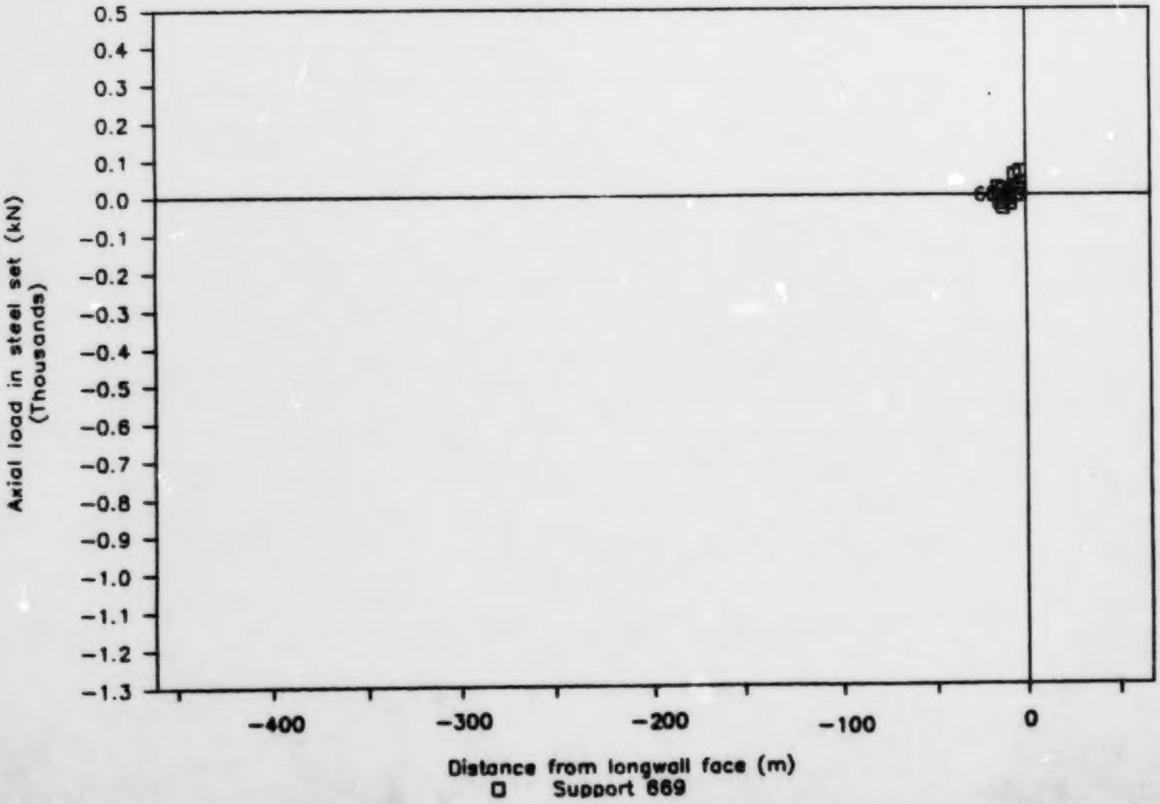
TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)



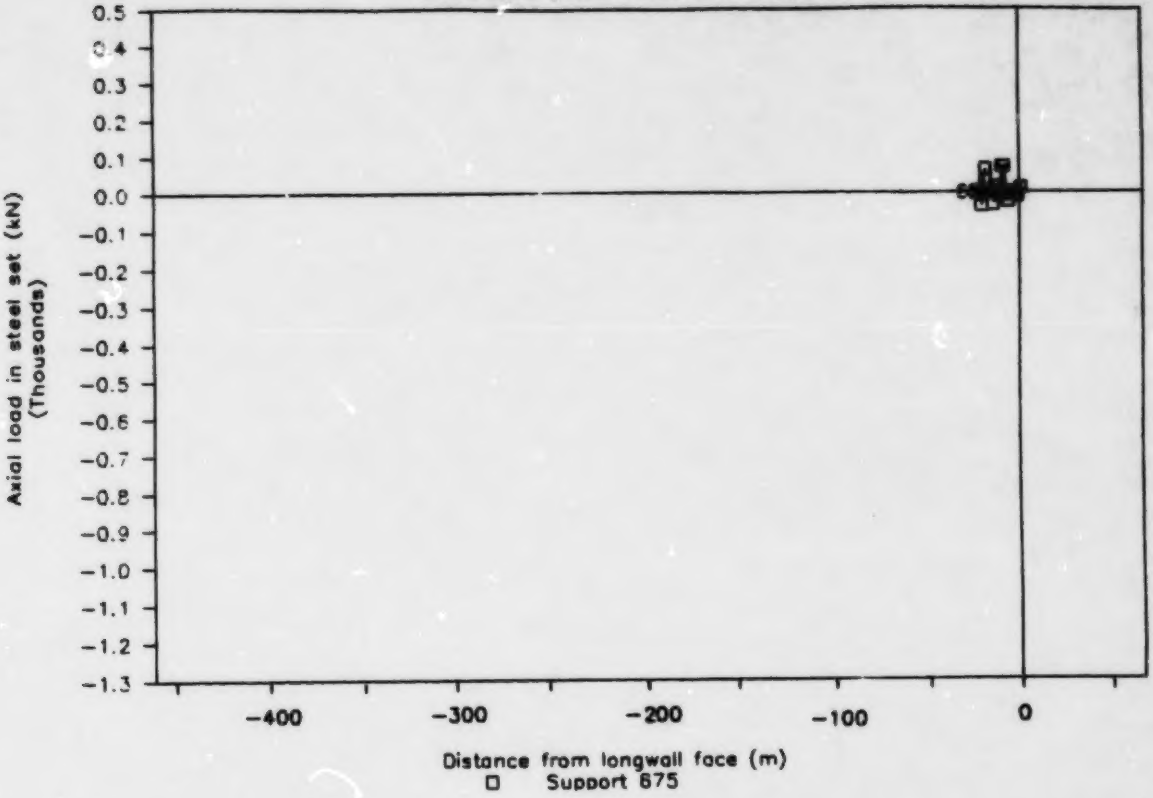
TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)



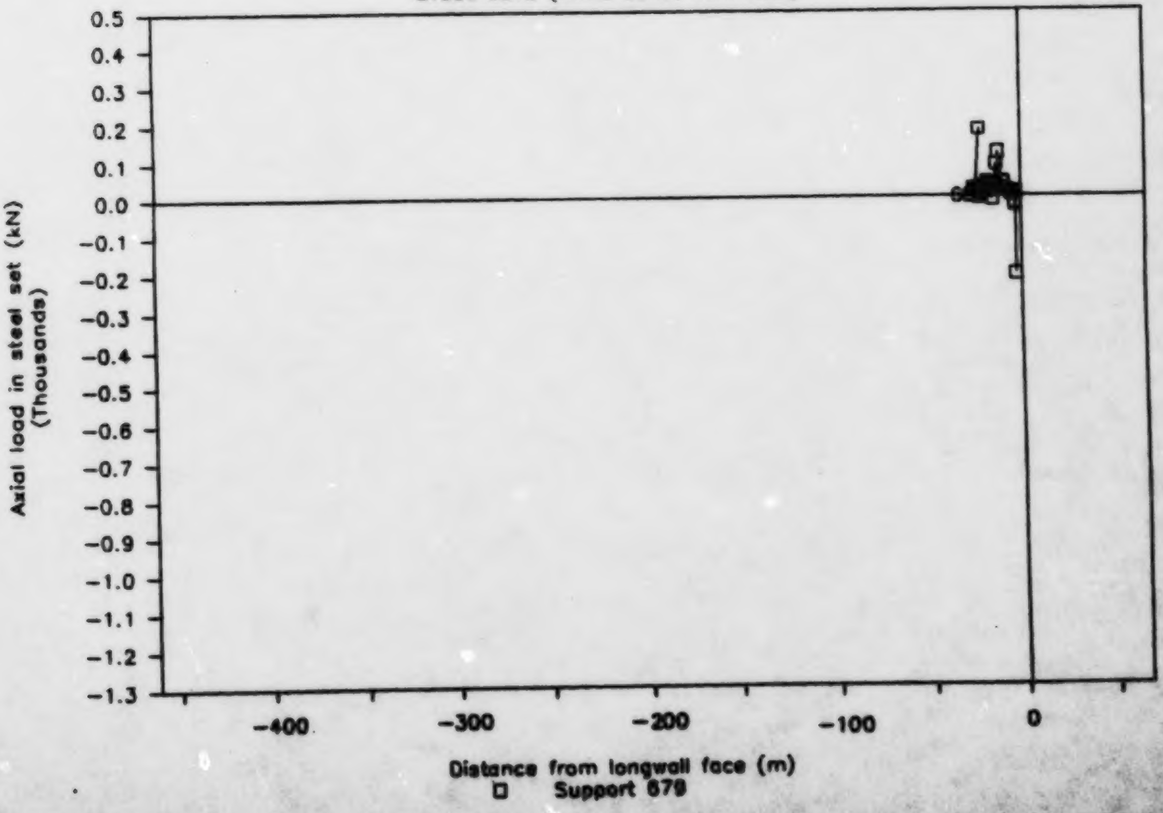
TEST SITE NO.1, PHALEN MINE

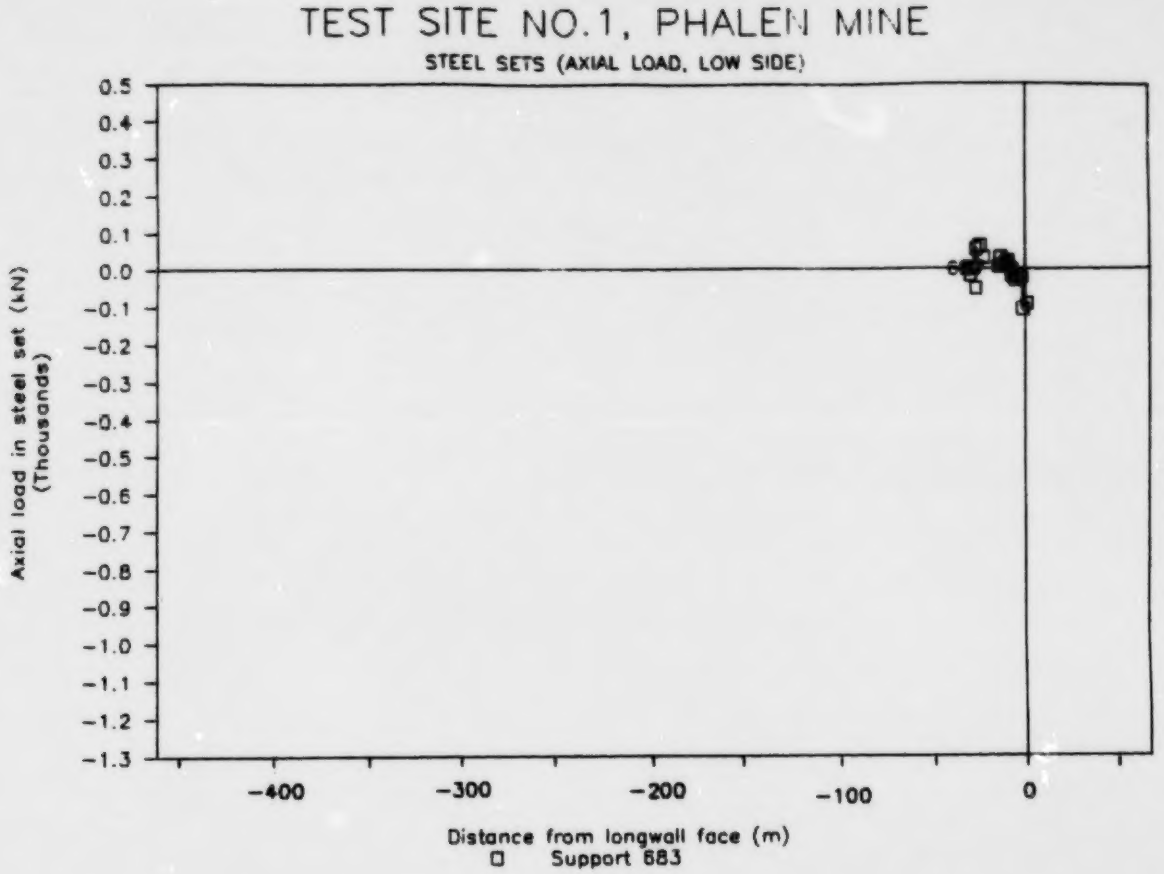
STEEL SETS (AXIAL LOAD, LOW SIDE)



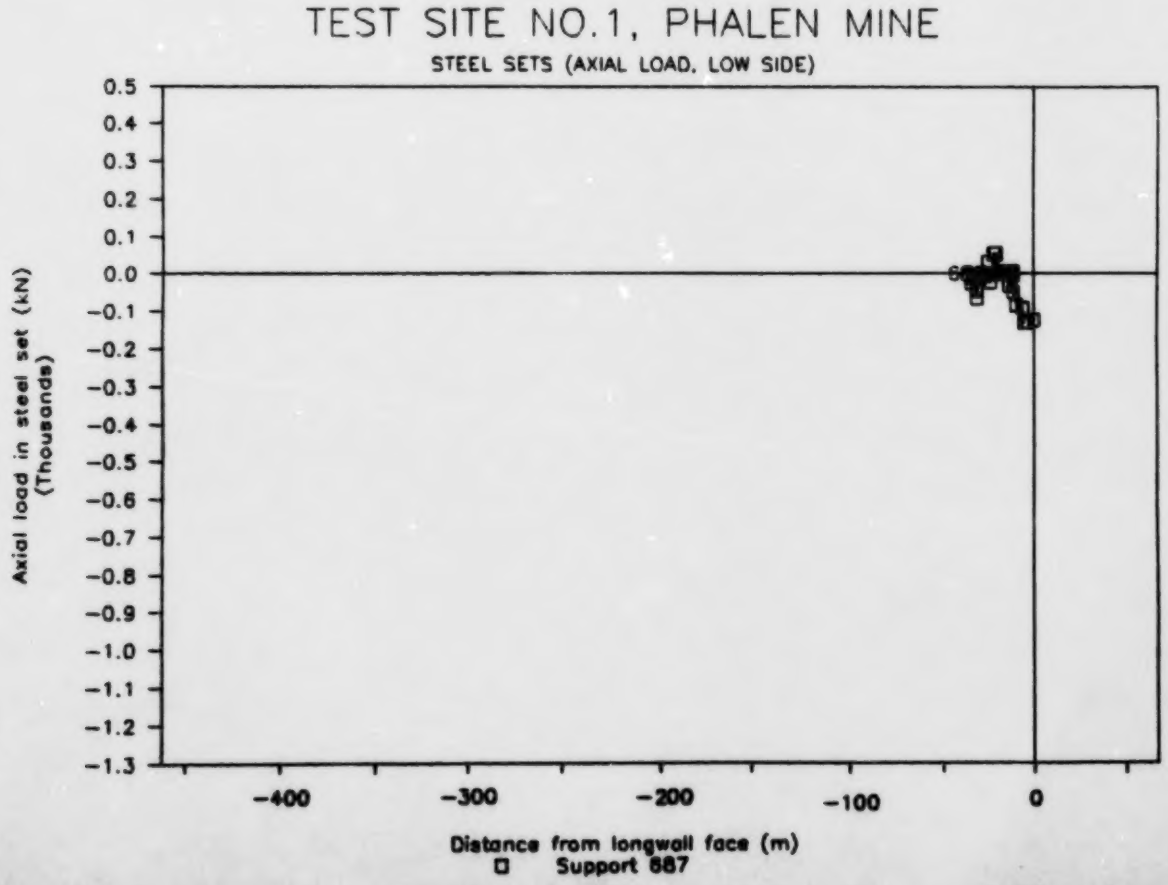
TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)

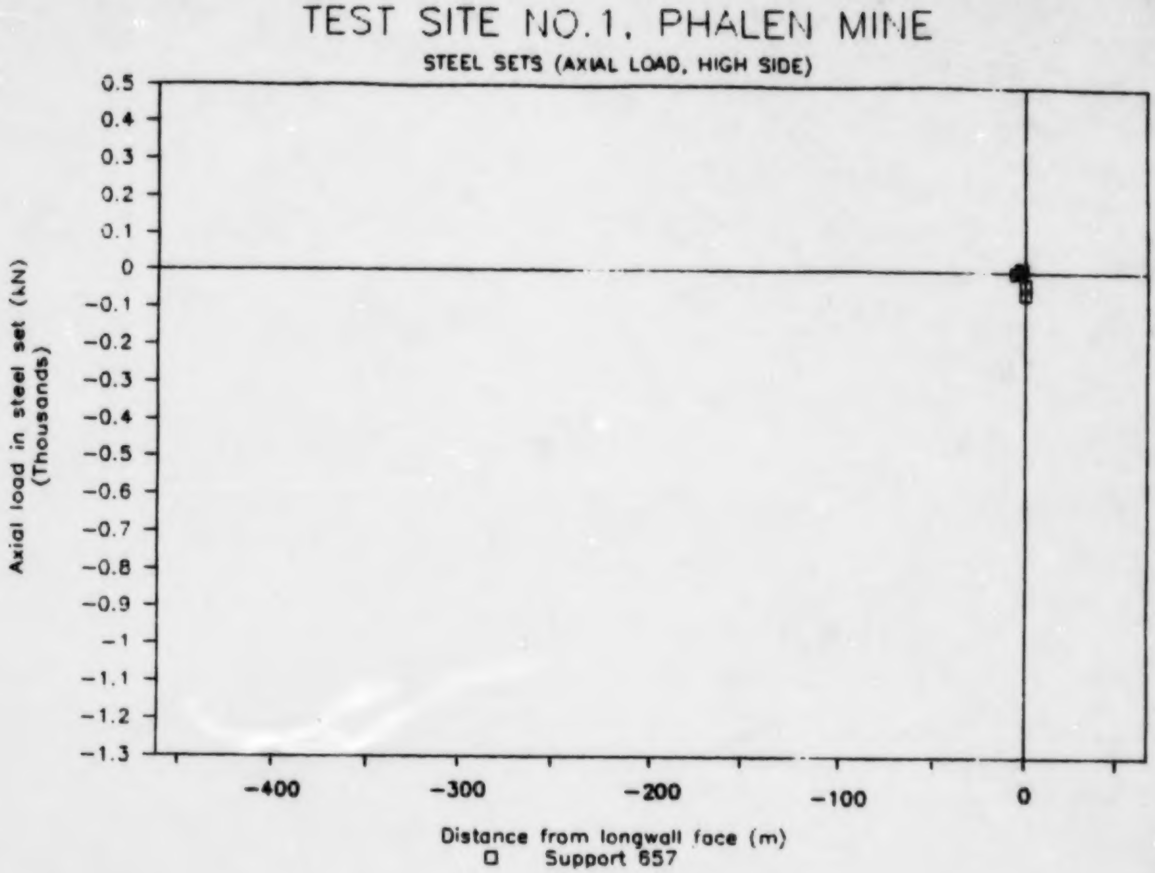


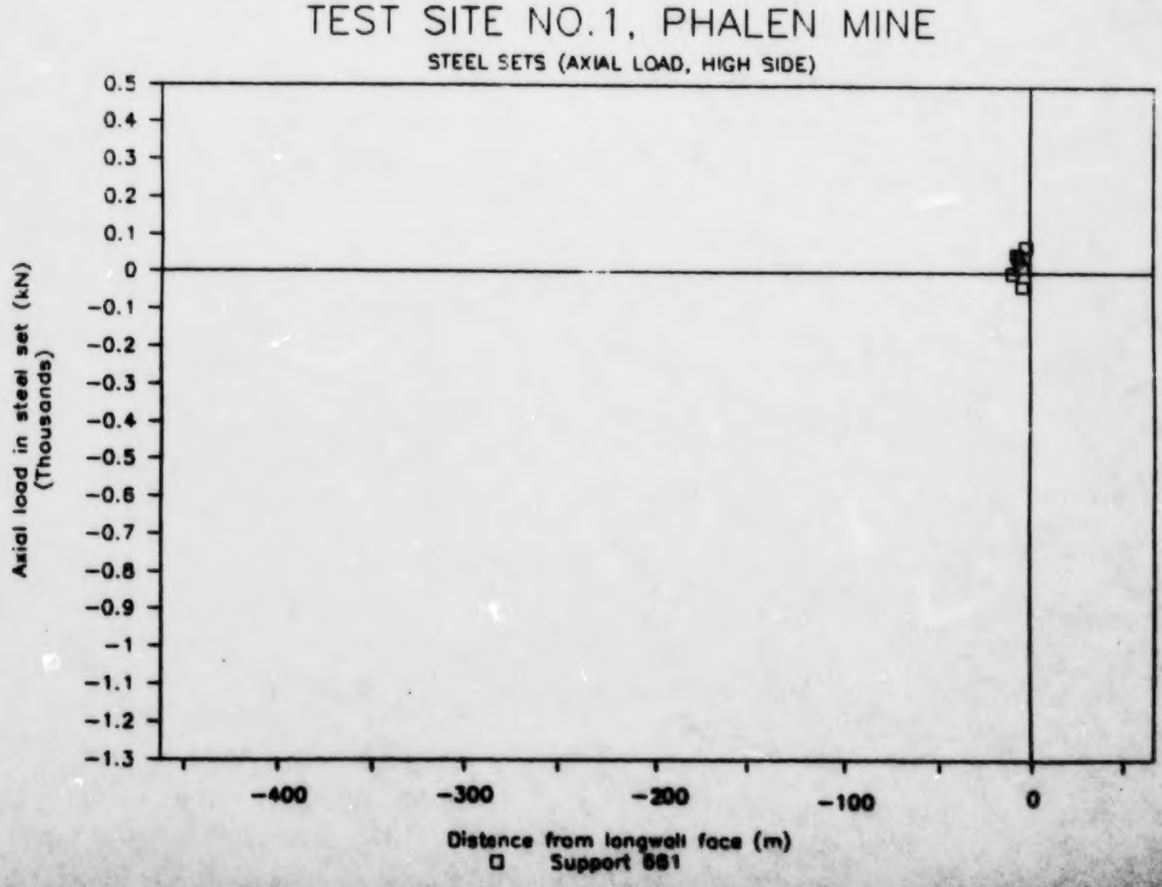

TEST SITE NO.1, PHALEN MINE

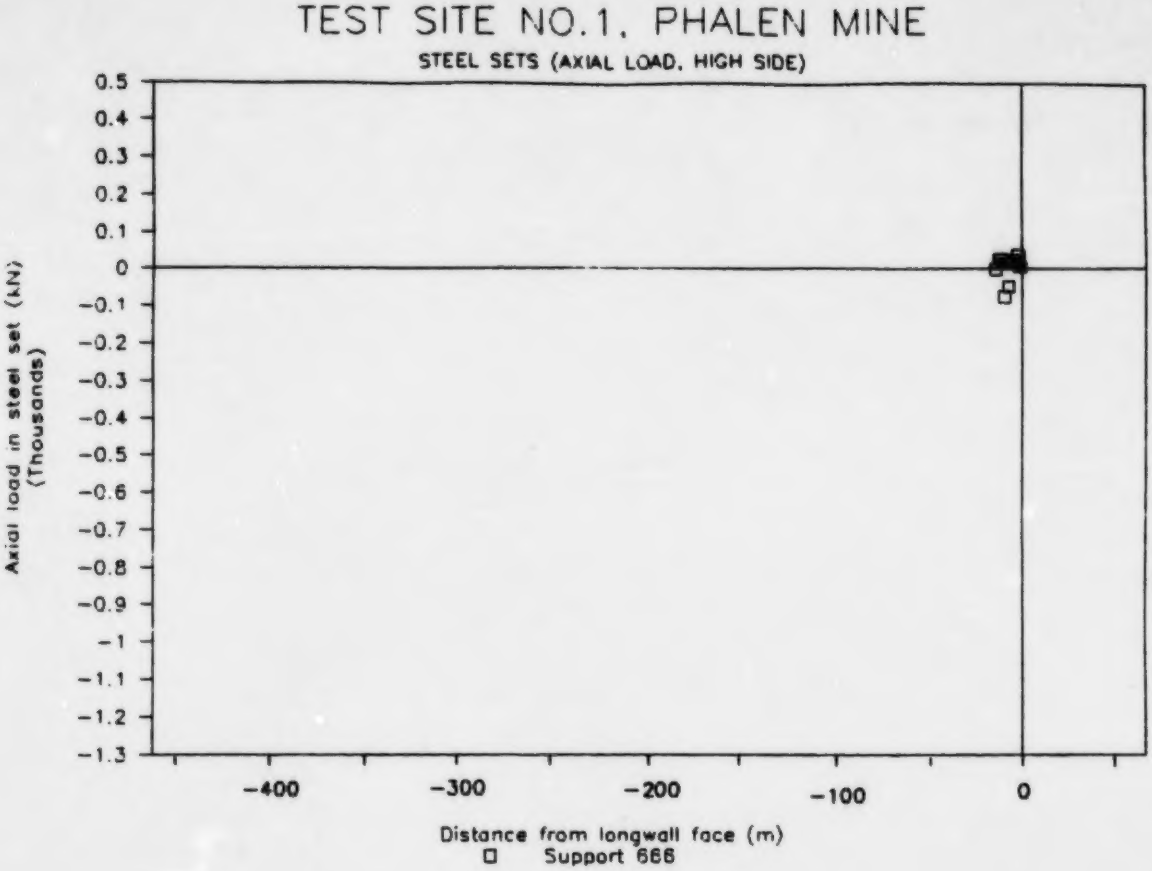
STEEL SETS (AXIAL LOAD, LOW SIDE)

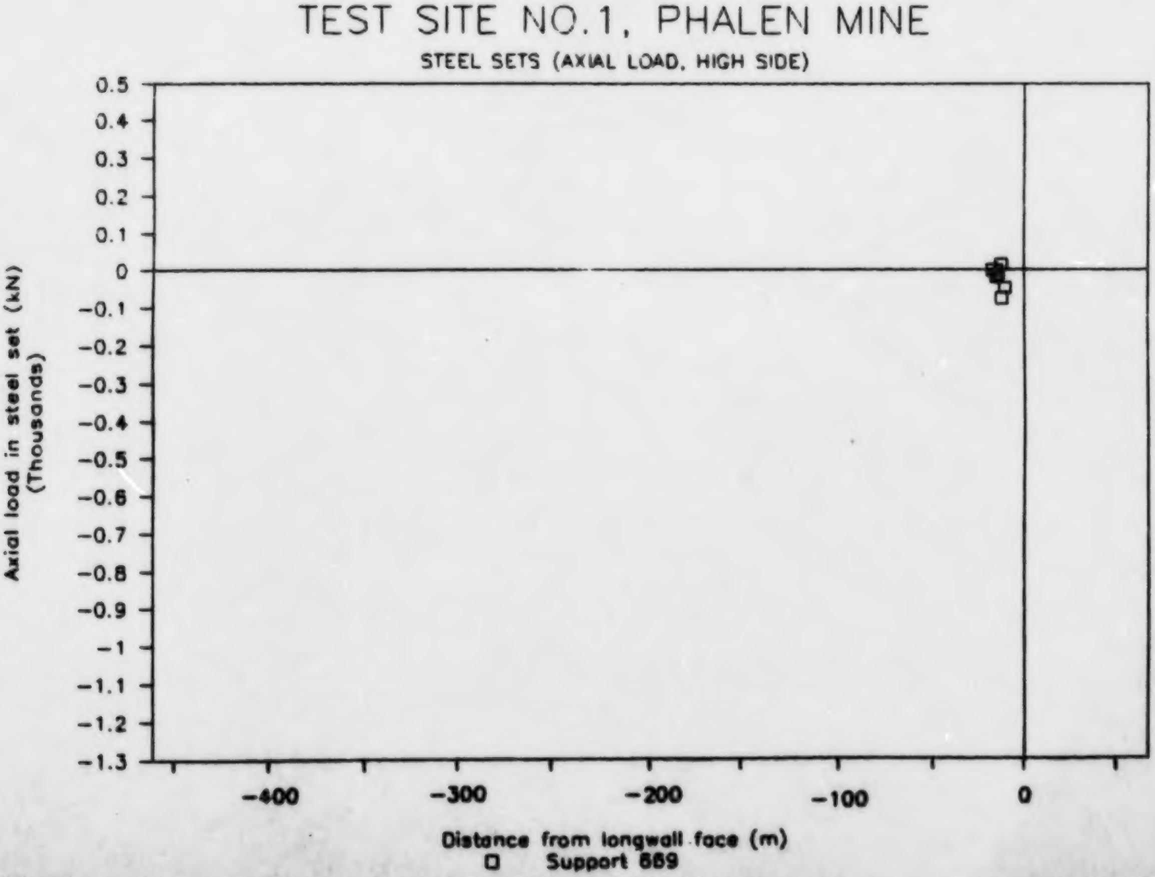

TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)


TEST SITE NO.1, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1
−1.1
−1.2
−1.3
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 657

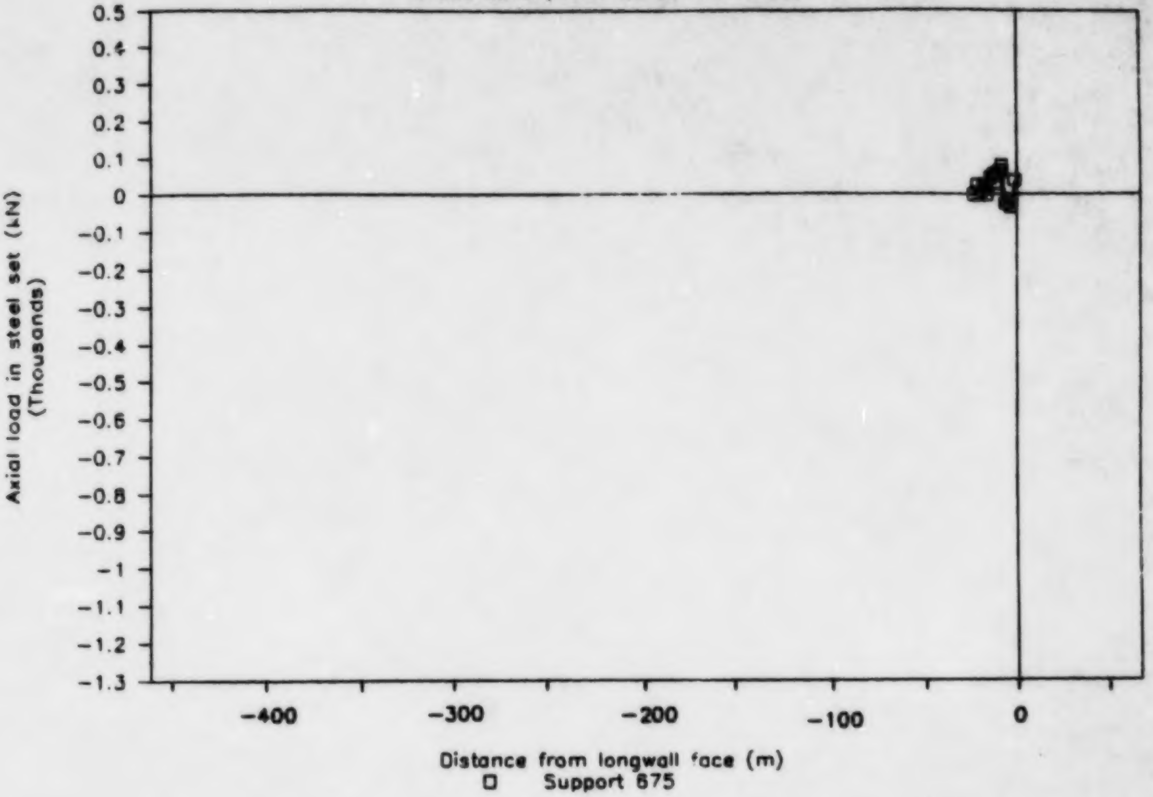

TEST SITE NO.1, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1
−1.1
−1.2
−1.3
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 661


TEST SITE NO.1, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
-400
-300
-200
-100
0
Distance from longwall face (m)
□ Support 666


TEST SITE NO.1, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
-400
-300
-200
-100
0
Distance from longwall face (m)
□ Support 669

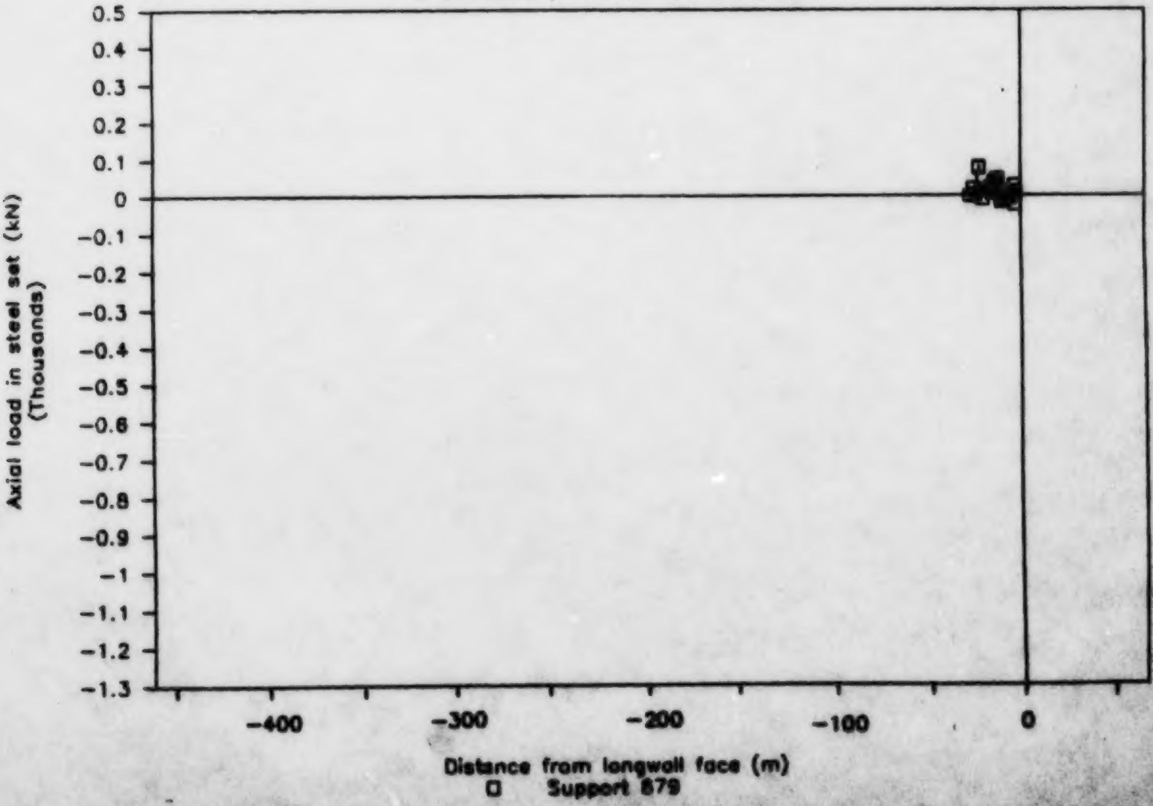
TEST SITE NO.1, PHALEN MINE

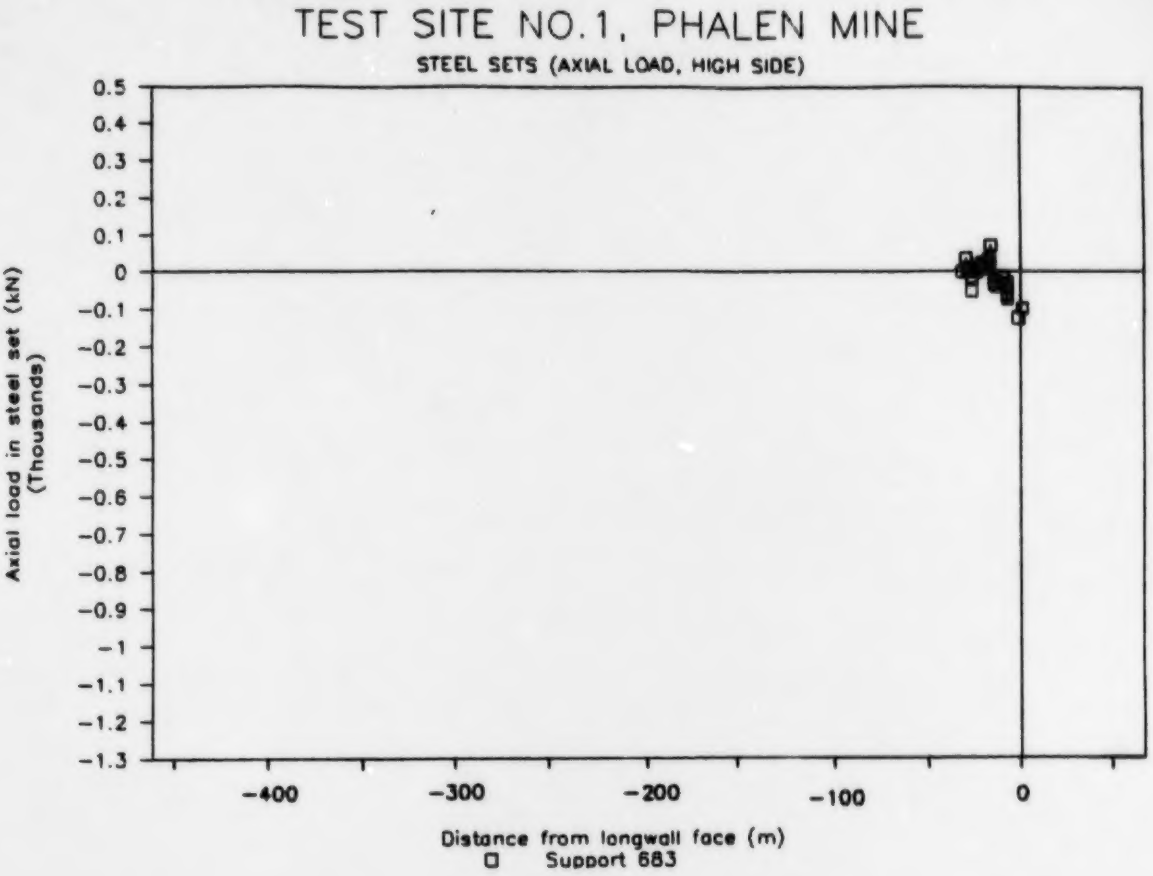
STEEL SETS (AXIAL LOAD, HIGH SIDE)

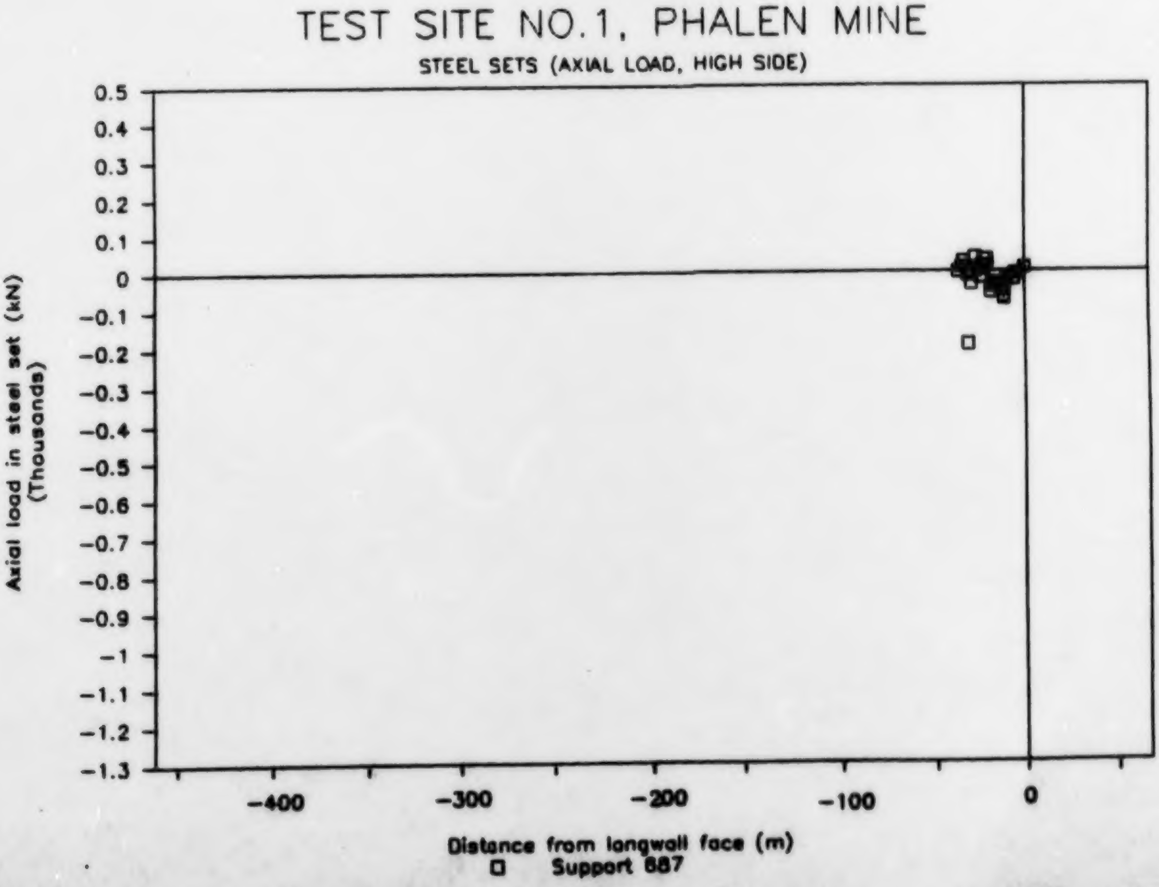


TEST SITE NO.1, PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)

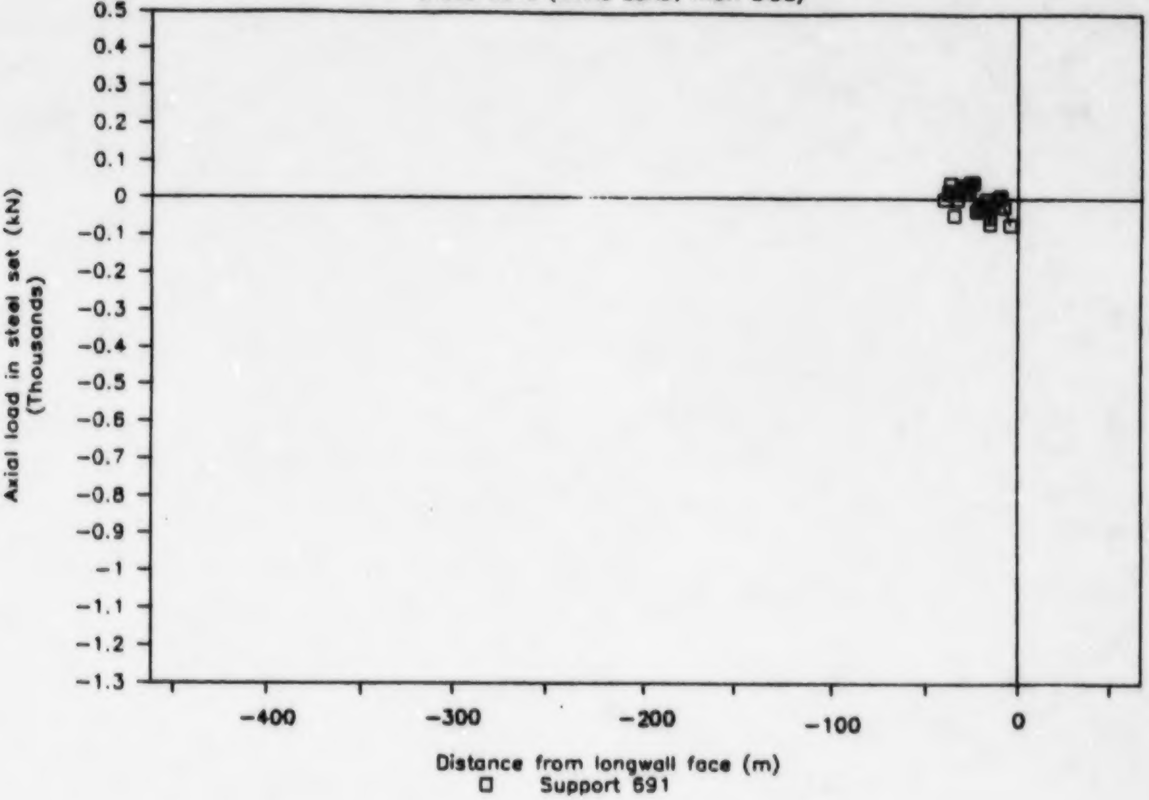


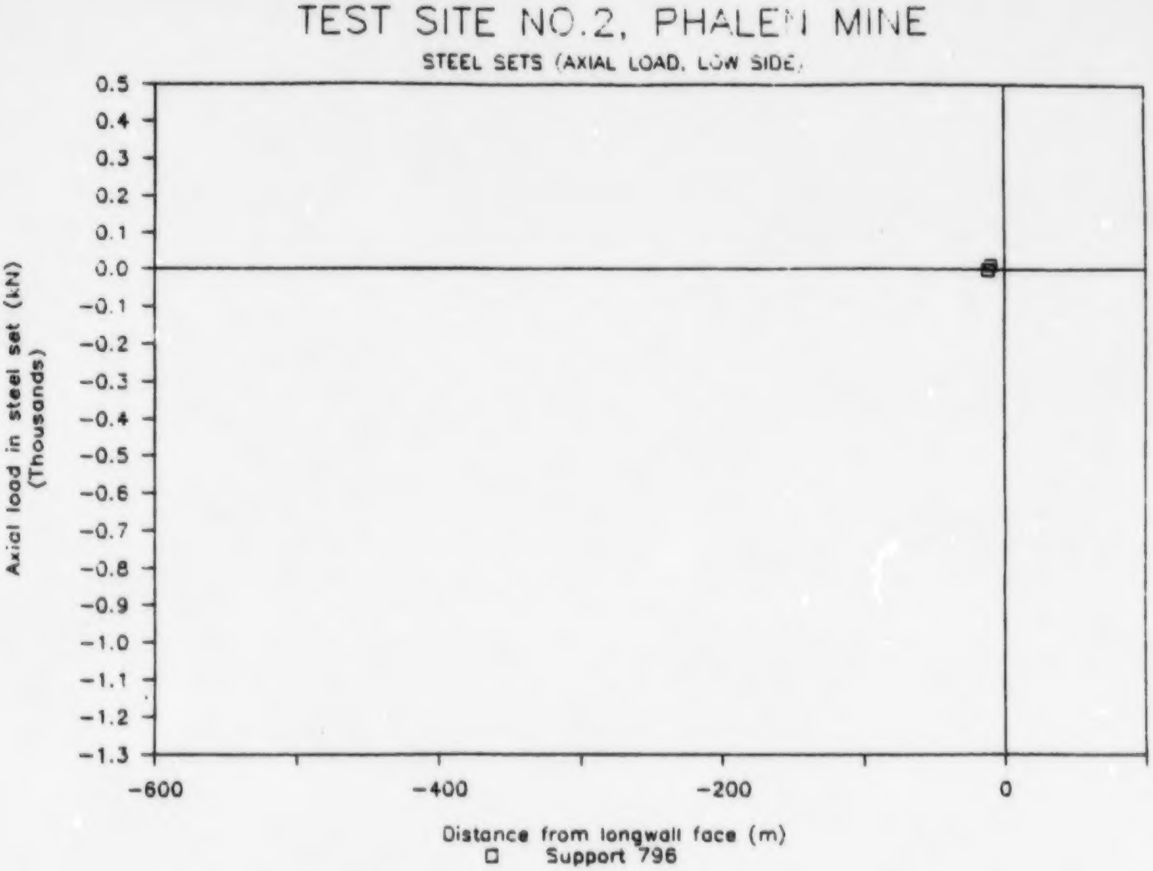

TEST SITE NO.1, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
-400
-300
-200
-100
0
Distance from longwall face (m)
□ Support 683

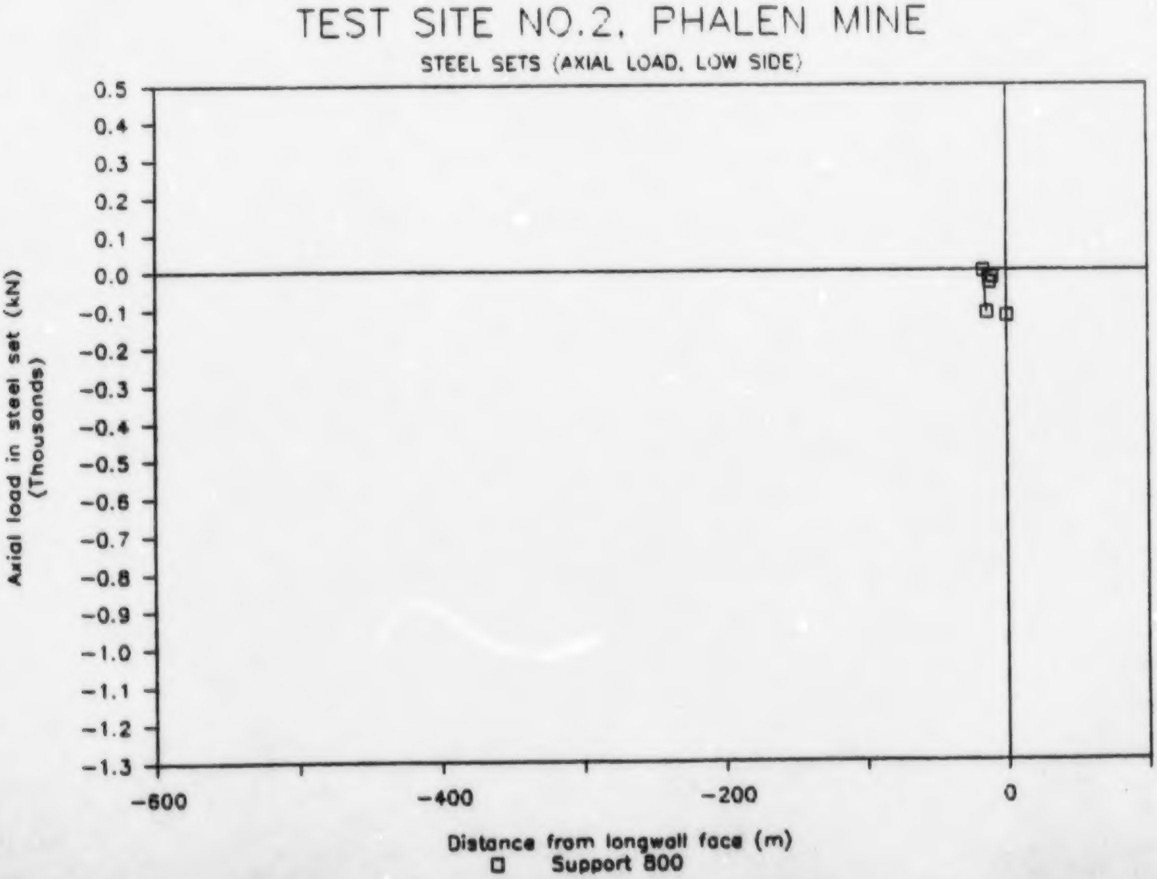

TEST SITE NO.1, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
-400
-300
-200
-100
0
Distance from longwall face (m)
□ Support 687

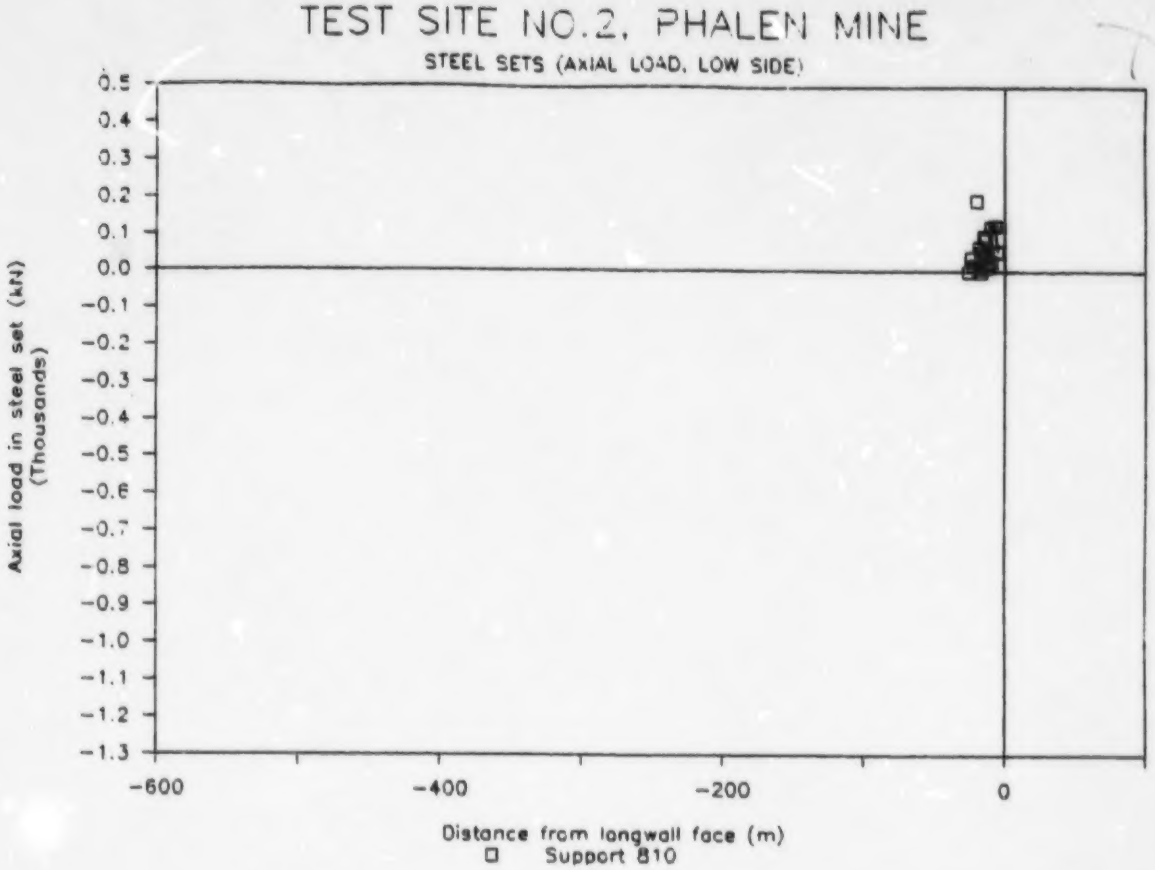
TEST SITE NO.1, PHALEN MINE

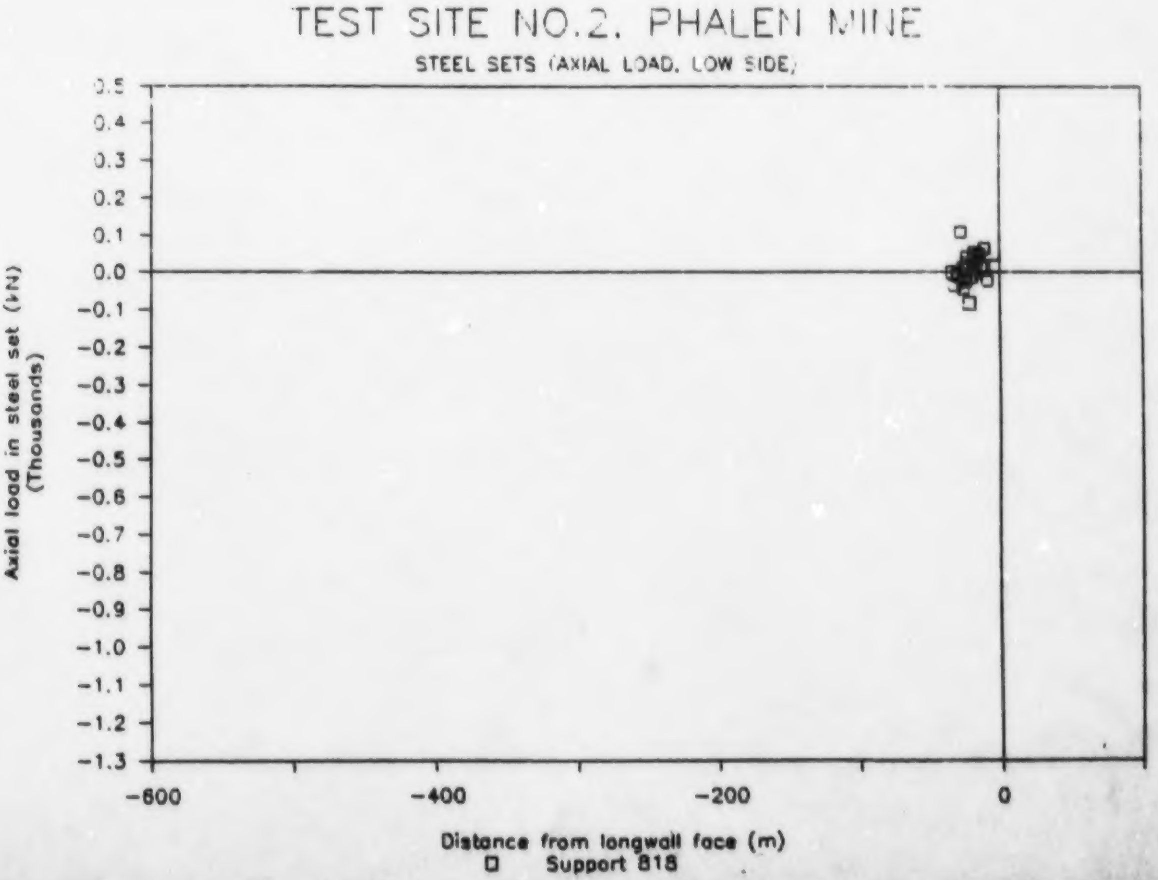
STEEL SETS (AXIAL LOAD, HIGH SIDE)




TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, LOW SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1.0
−1.1
−1.2
−1.3
−600
−400
−200
0
Distance from longwall face (m)
□ Support 796

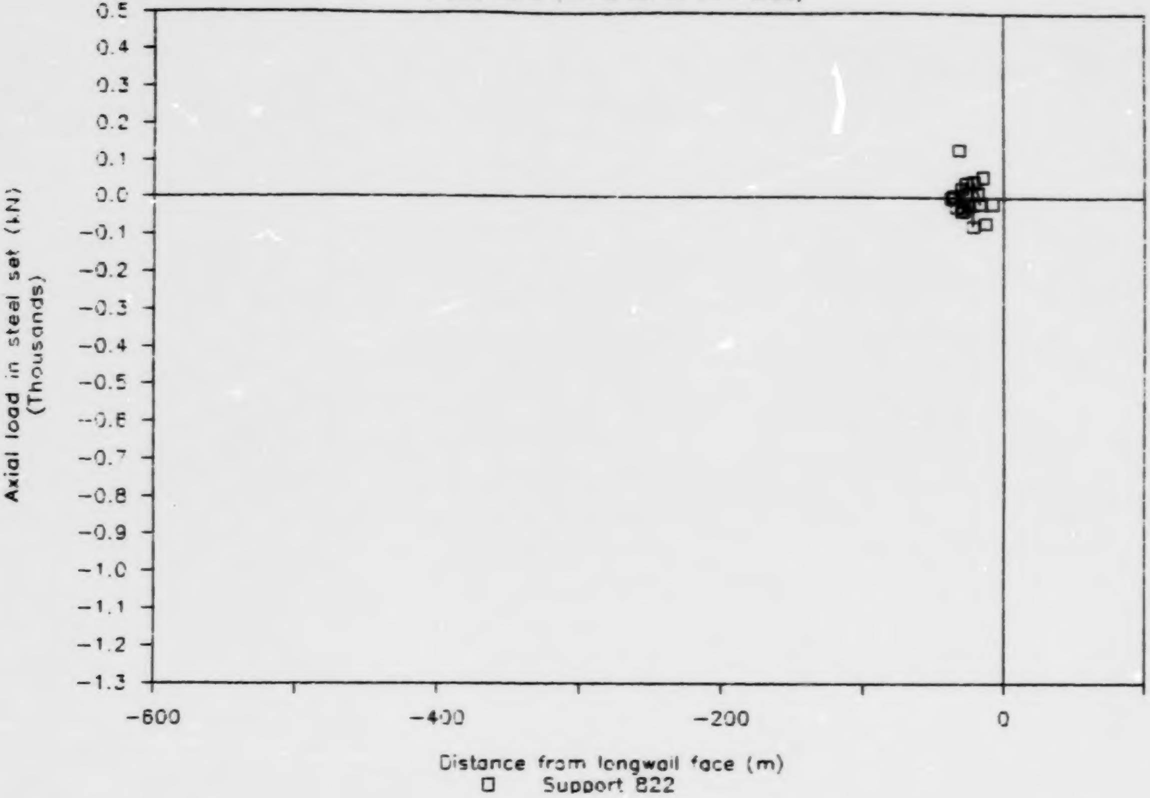

TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, LOW SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1.0
−1.1
−1.2
−1.3
−600
−400
−200
0
Distance from longwall face (m)
□ Support 800


TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, LOW SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
-1.1
-1.2
-1.3
-600
-400
-200
0
Distance from longwall face (m)
□ Support 810


TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, LOW SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
-1.1
-1.2
-1.3
-600
-400
-200
0
Distance from longwall face (m)
□ Support 818

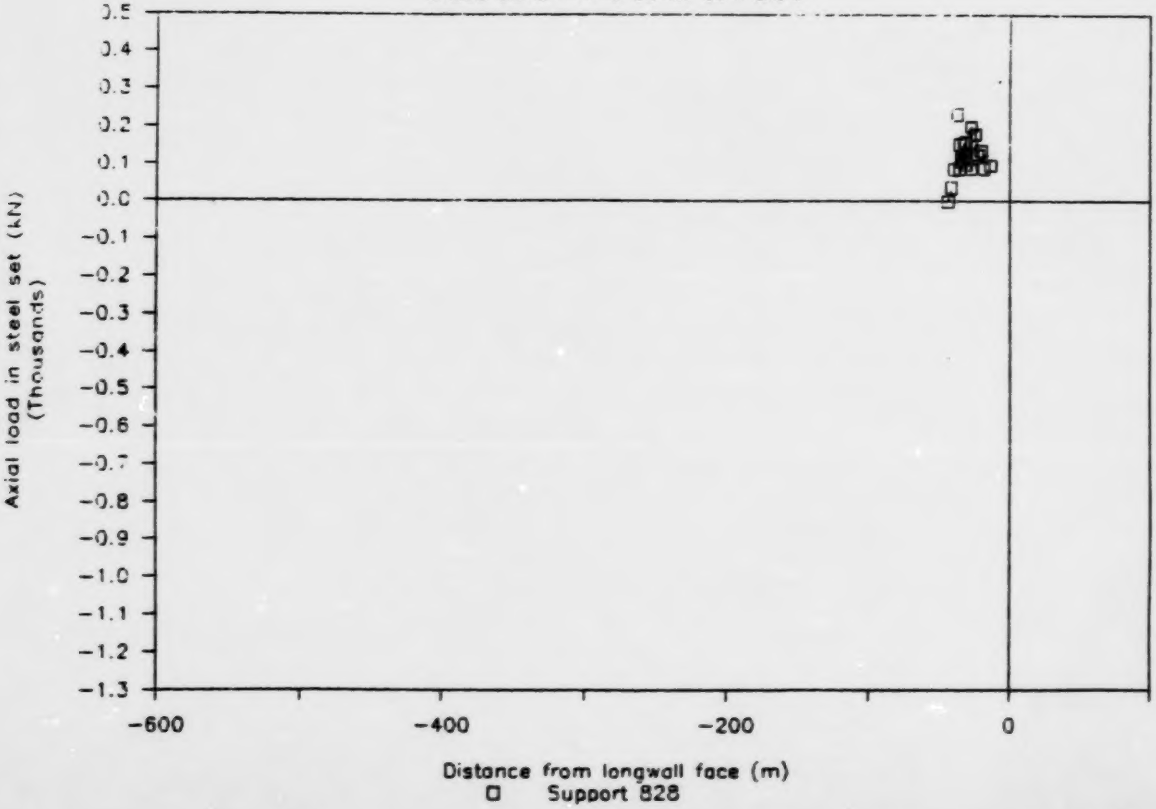
TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)



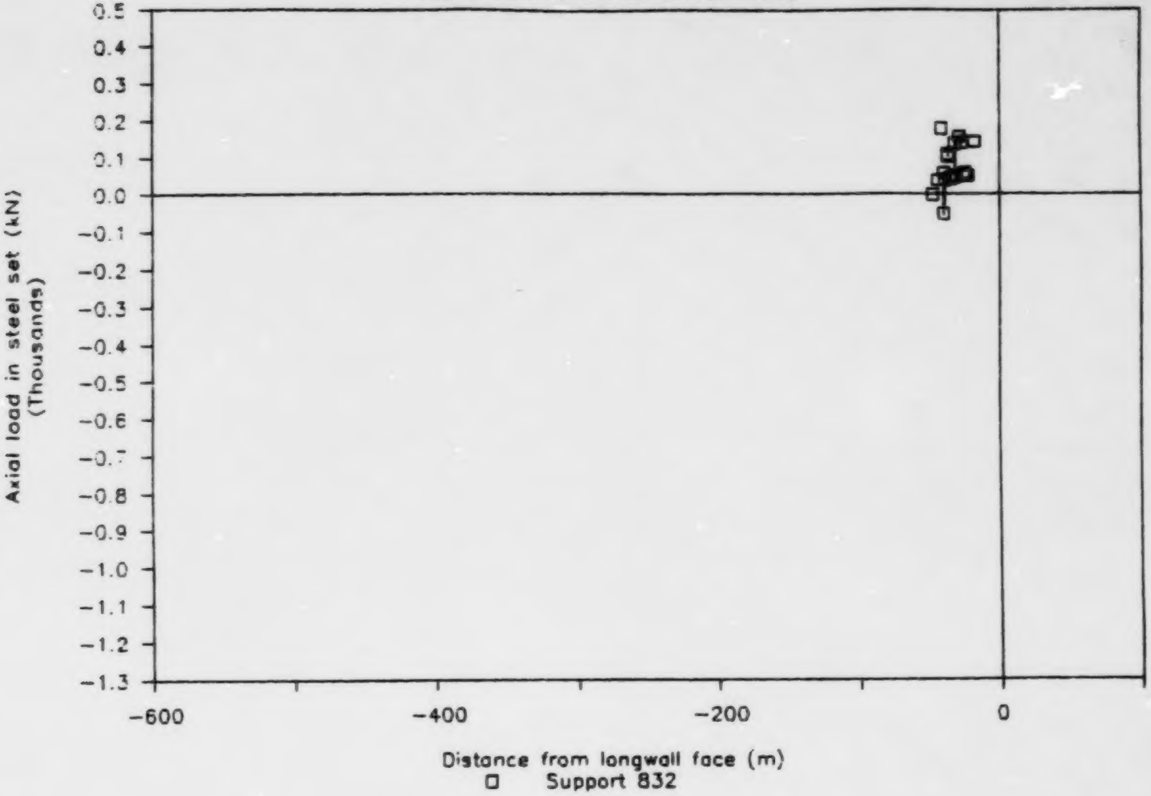
TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)



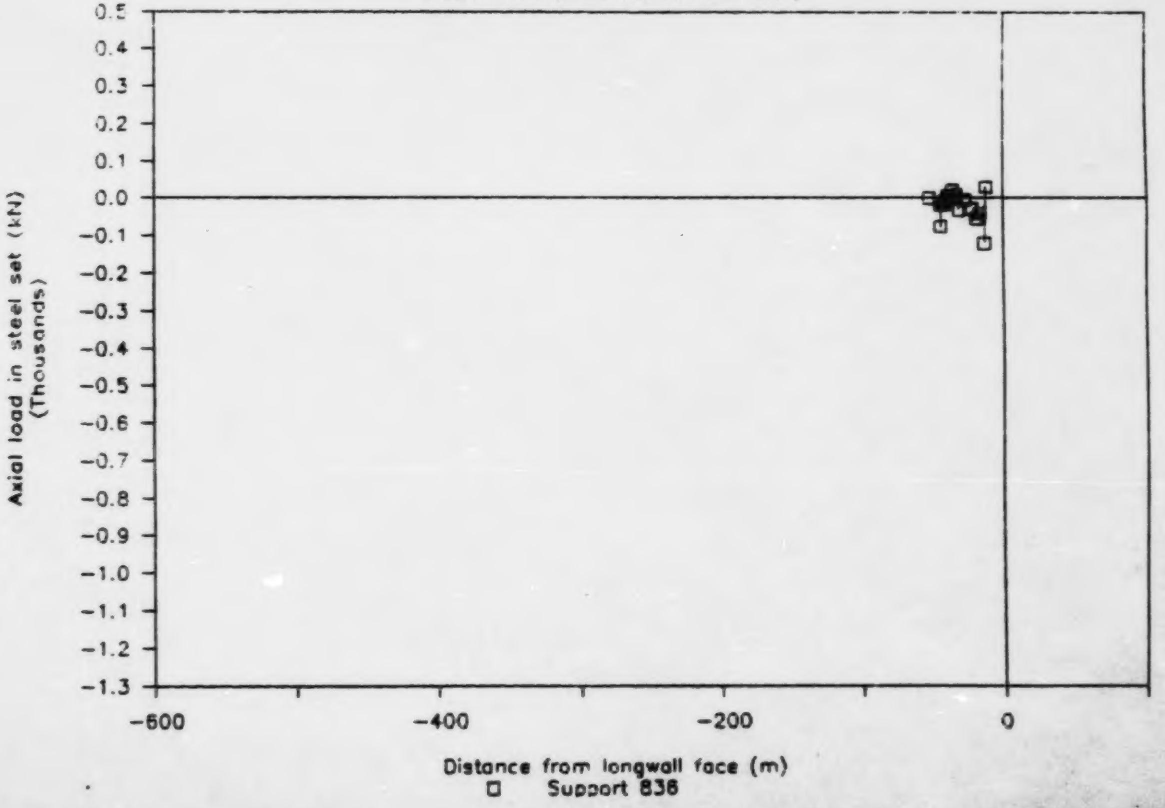
TEST SITE NO.2, PHALEN MINE

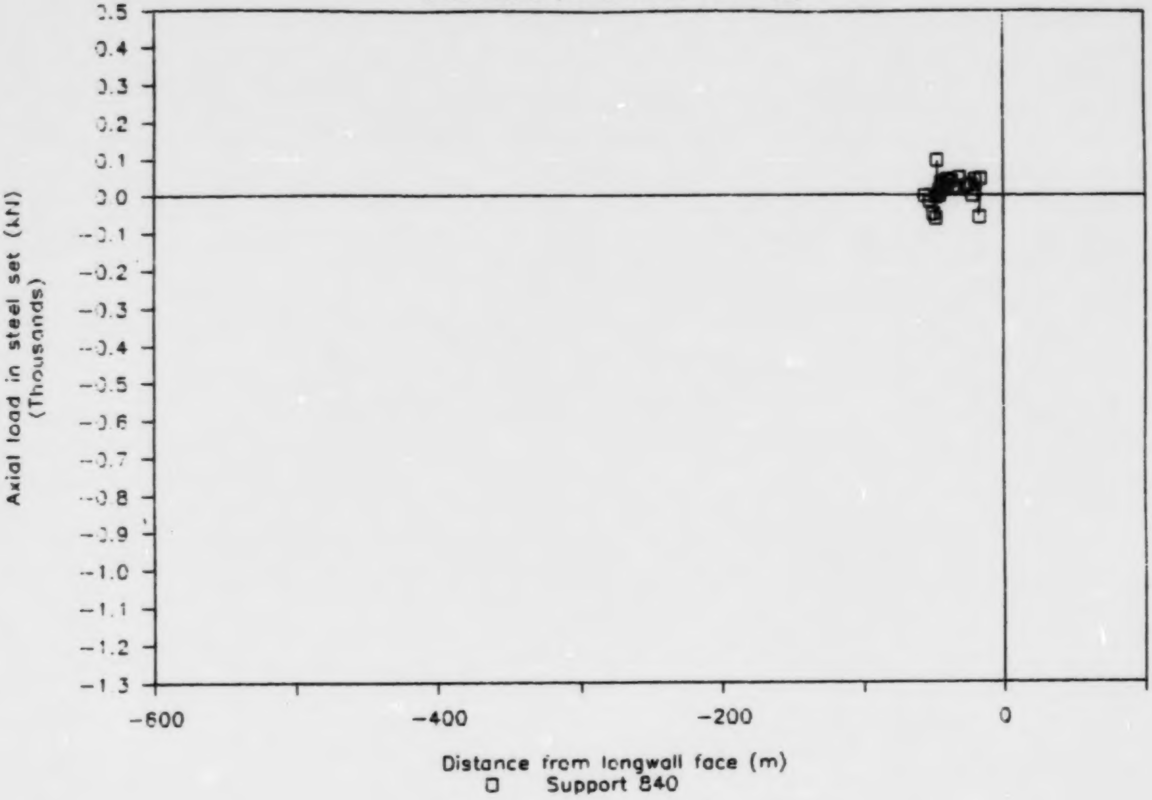
STEEL SETS (AXIAL LOAD, LOW SIDE)



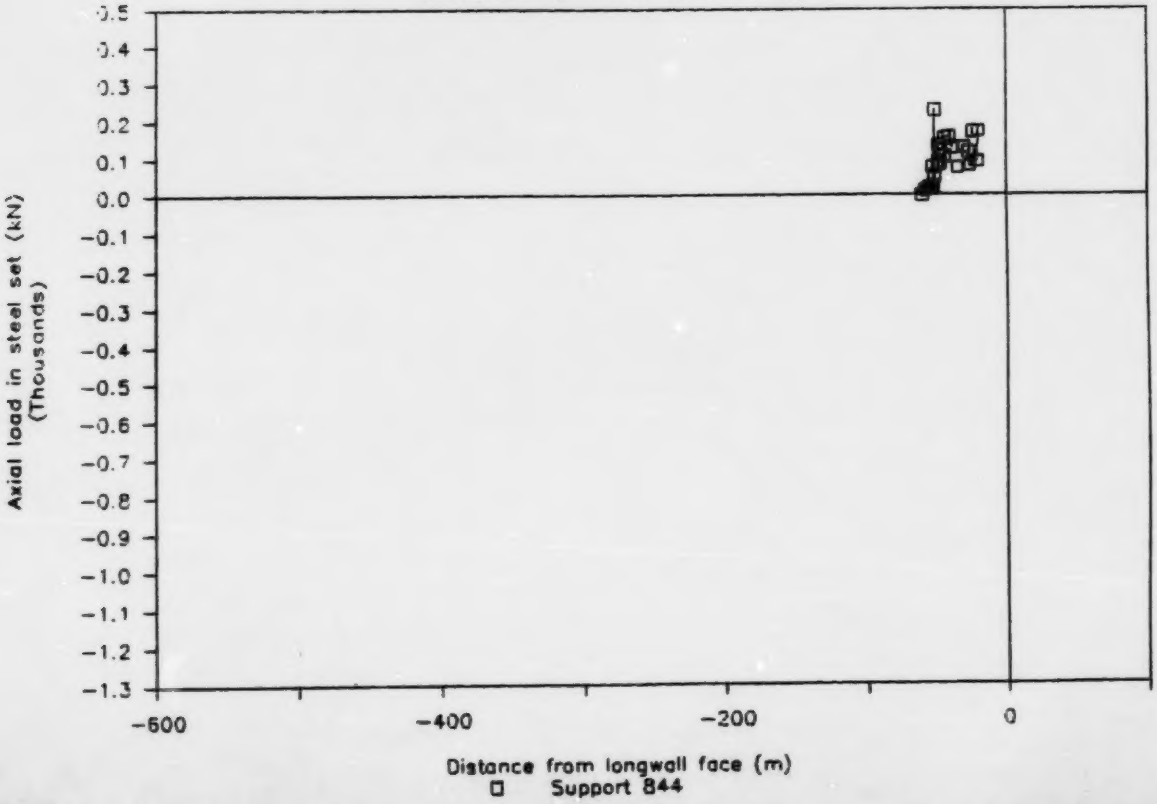
TEST SITE NO.2, PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)

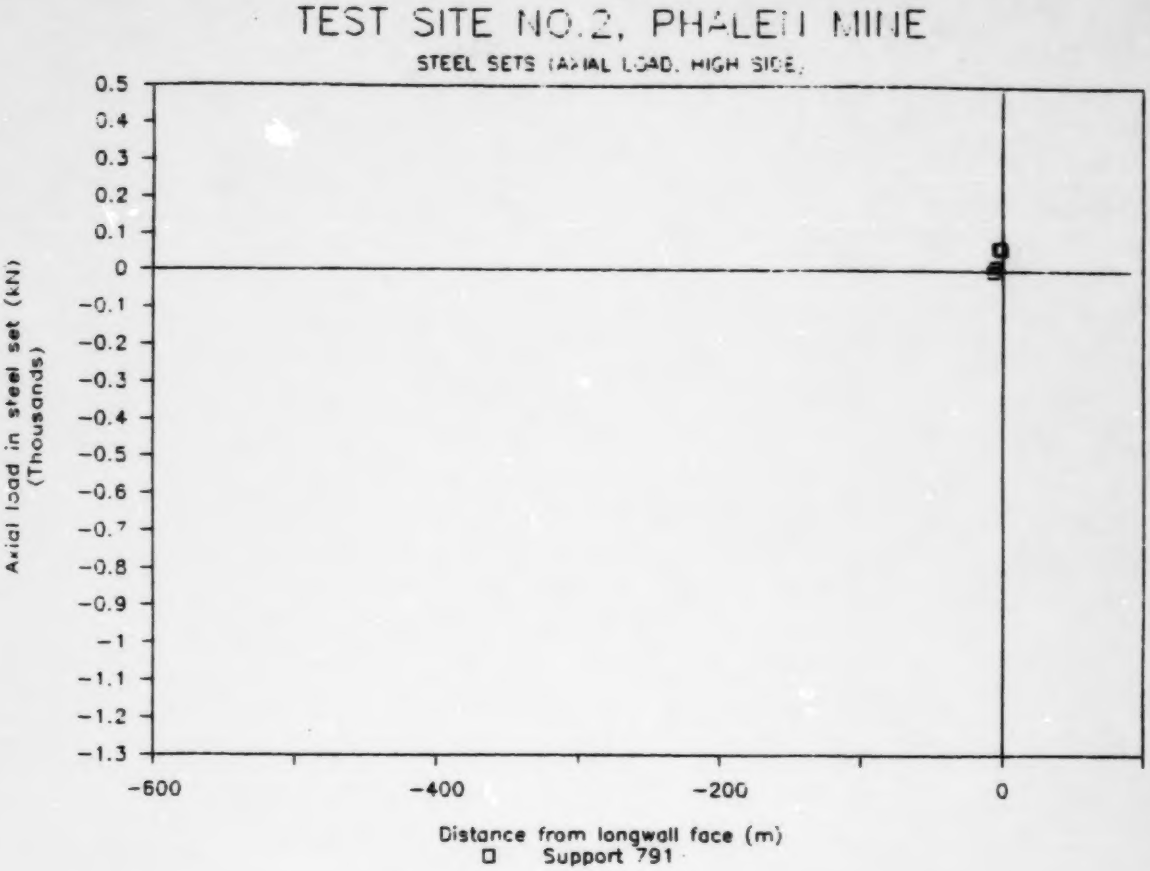


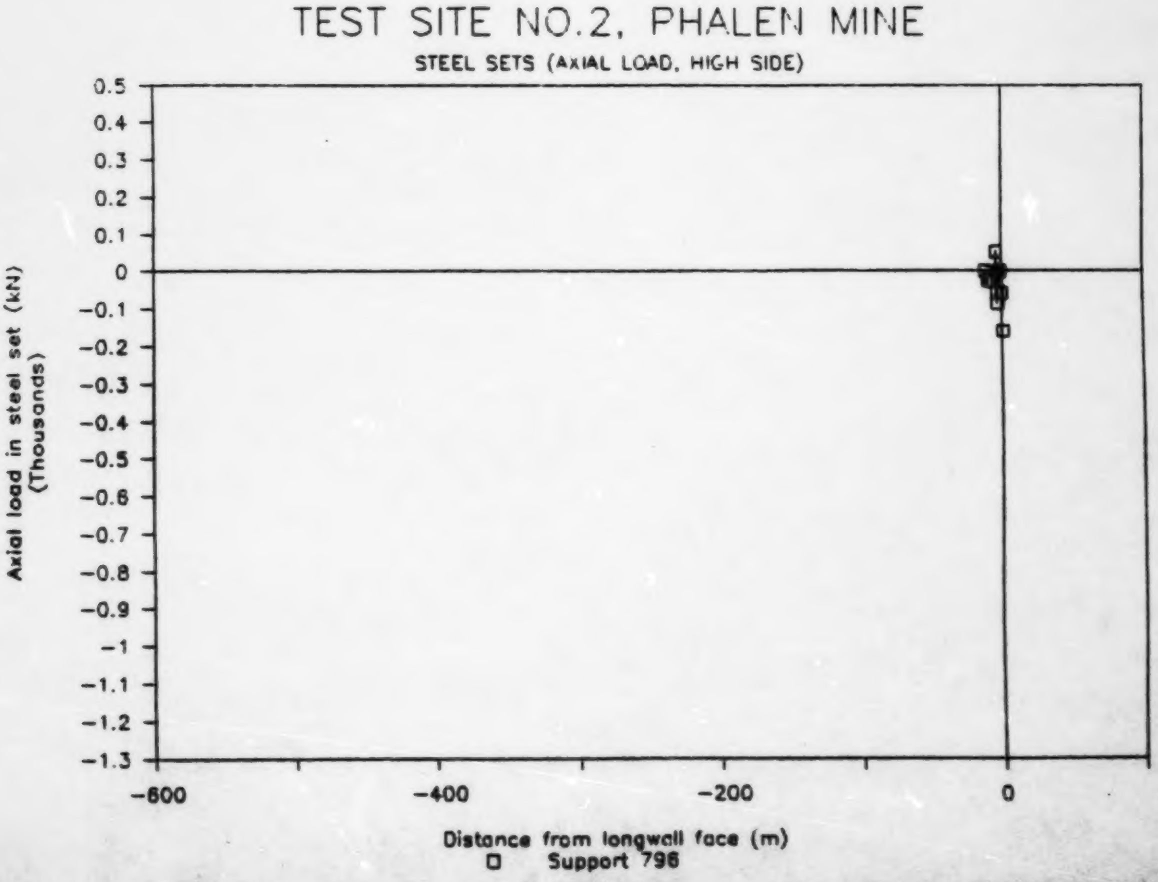

TEST SITE NO.2. PHALEN MINE

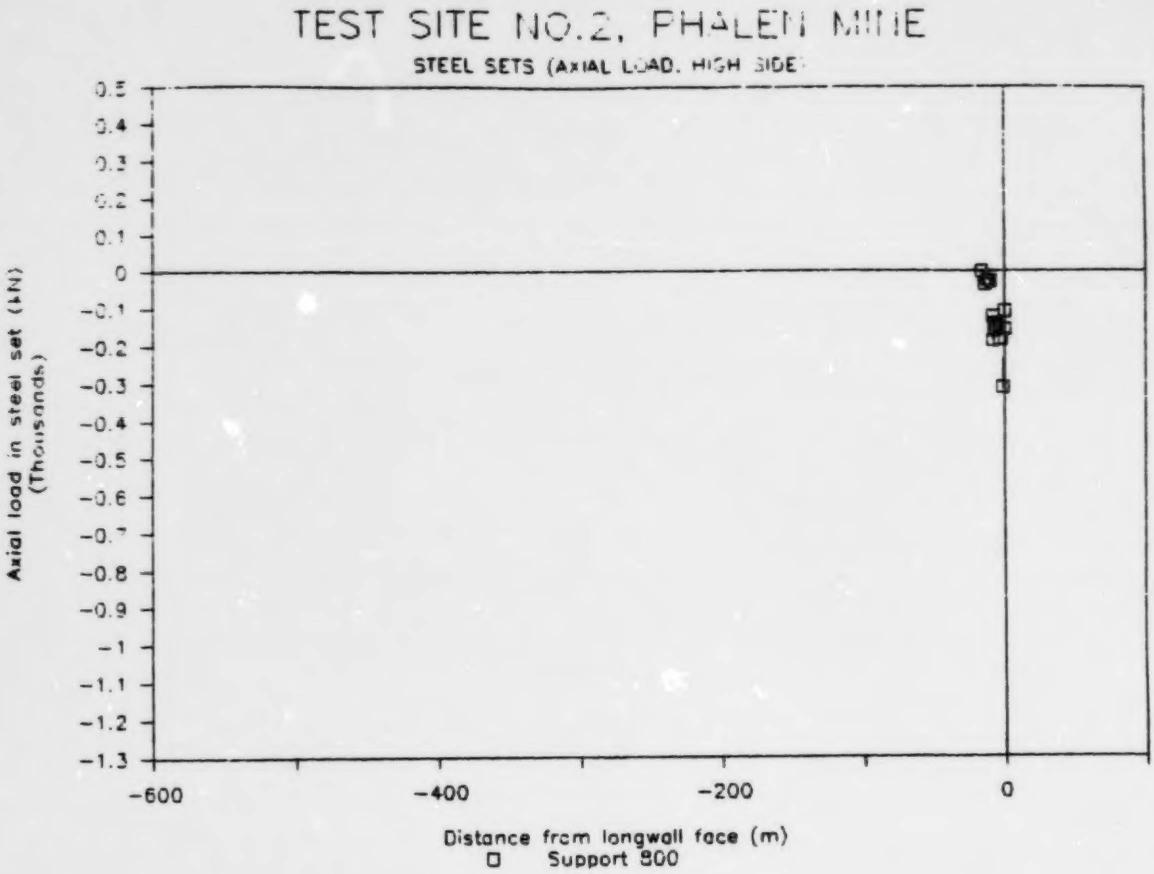
STEEL SETS (AXIAL LOAD, LOW SIDE)

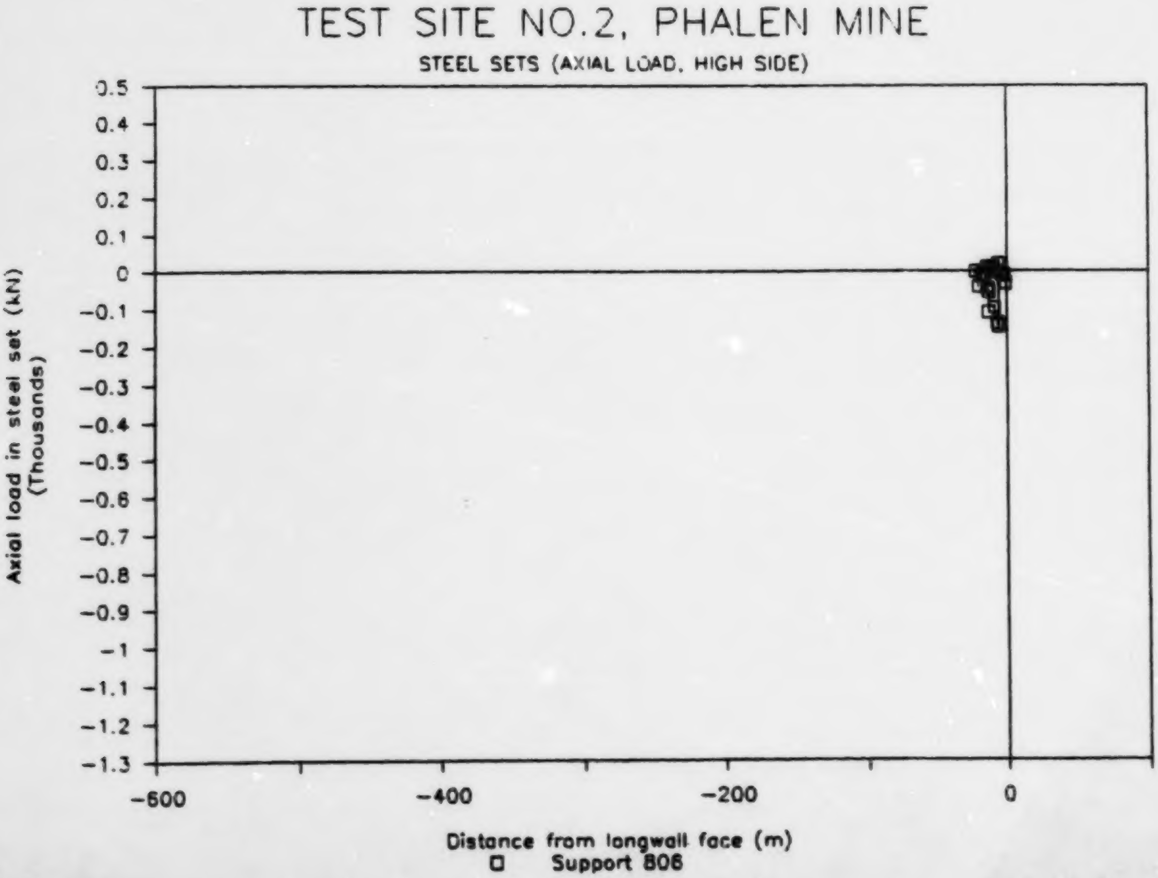

TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, LOW SIDE)


TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
-600
-400
-200
0
Distance from longwall face (m)
☐ Support 791

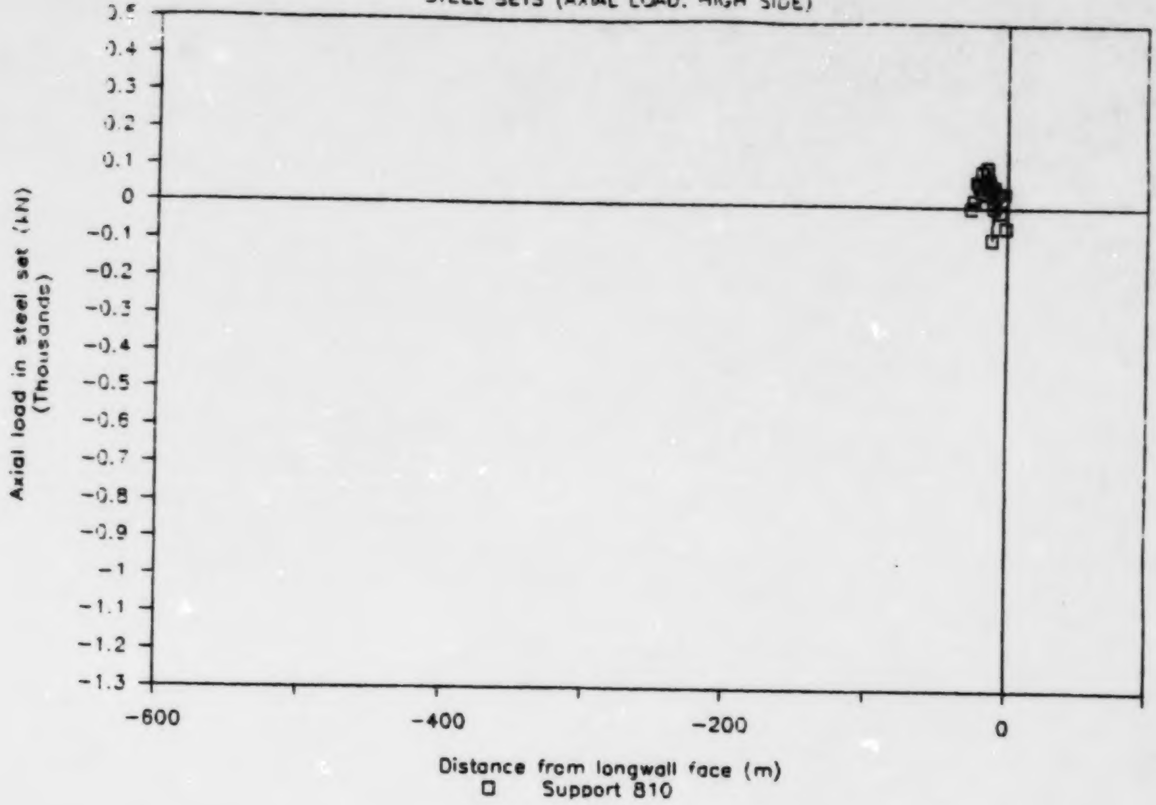

TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1
-1.1
-1.2
-1.3
-600
-400
-200
0
Distance from longwall face (m)
☐ Support 796


TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1
−1.1
−1.2
−1.3
−600
−400
−200
0
Distance from longwall face (m)
□ Support 800


TEST SITE NO.2, PHALEN MINE
STEEL SETS (AXIAL LOAD, HIGH SIDE)
Axial load in steel set (kN)
(Thousands)
0.5
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1
−1.1
−1.2
−1.3
−600
−400
−200
0
Distance from longwall face (m)
□ Support 806

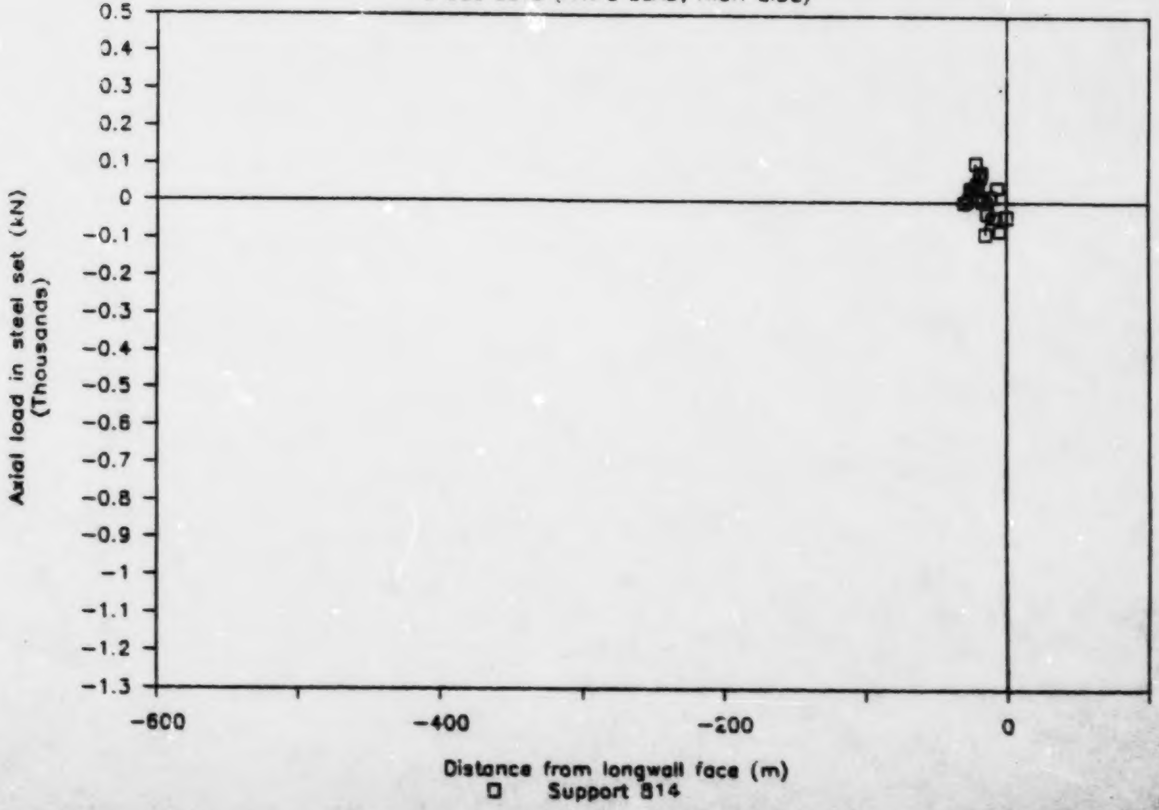
TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)



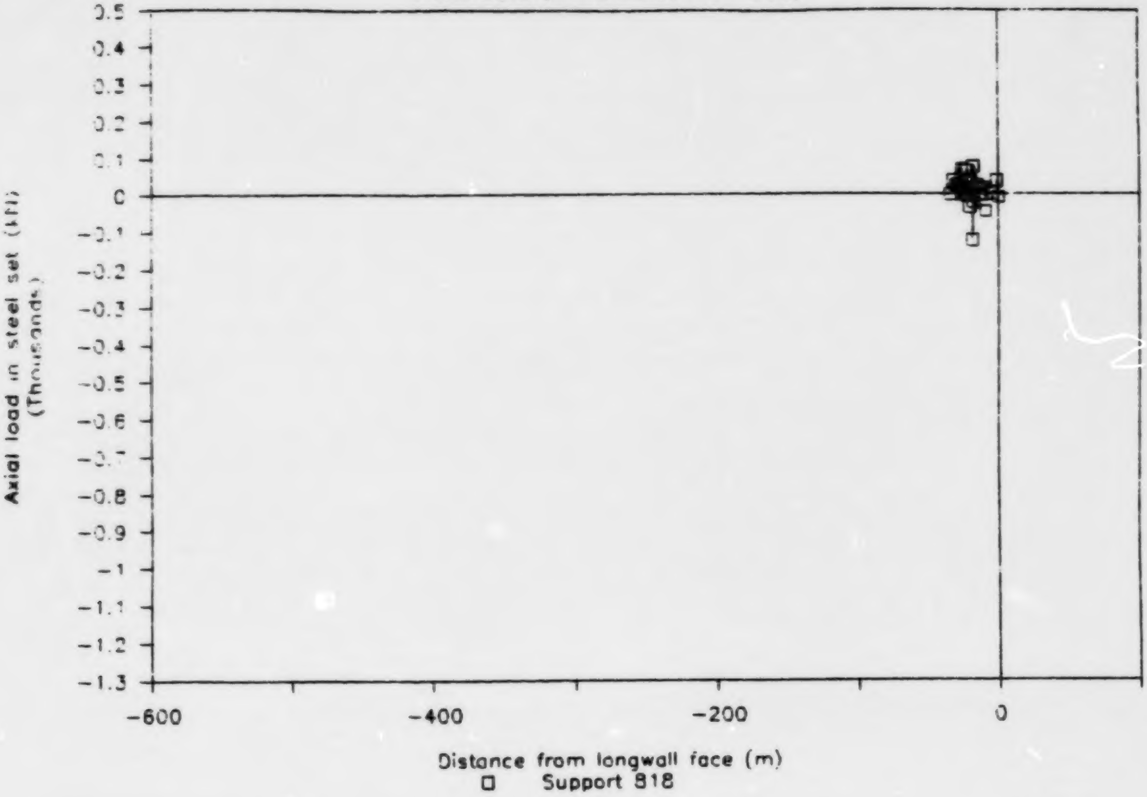
TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)



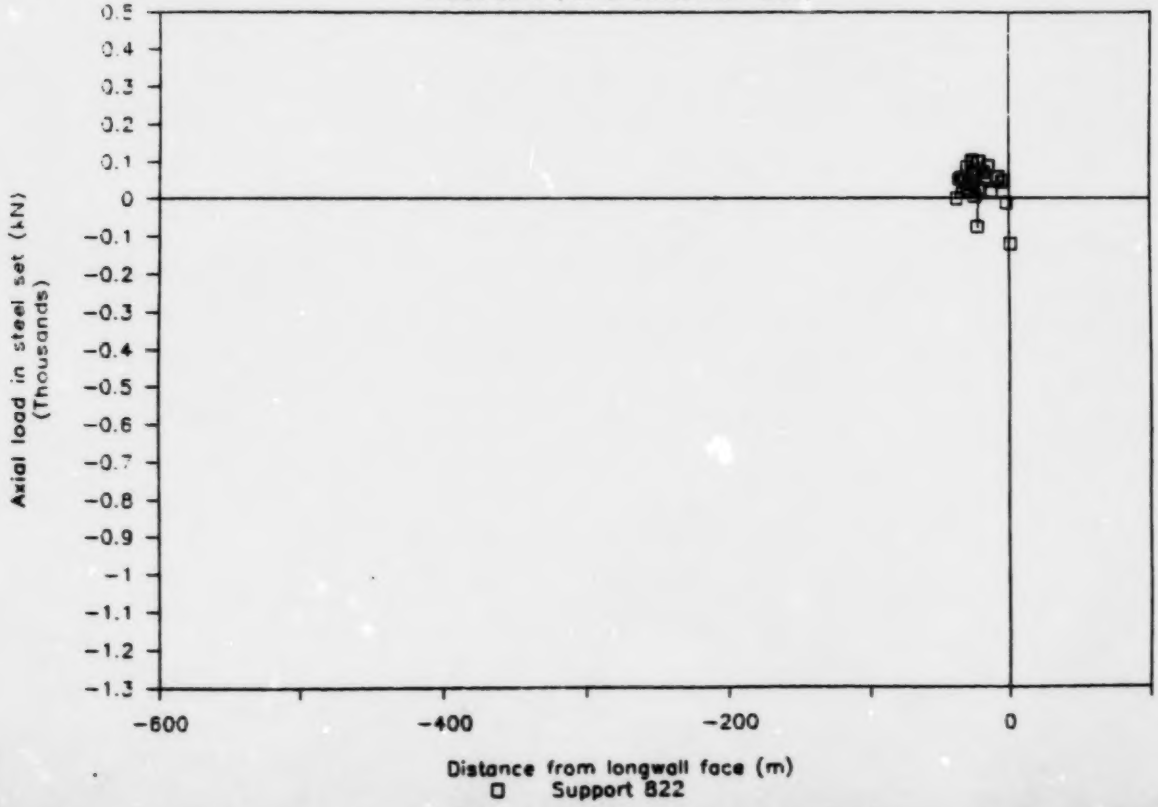
TEST SITE NO.2, PHALEN MINE

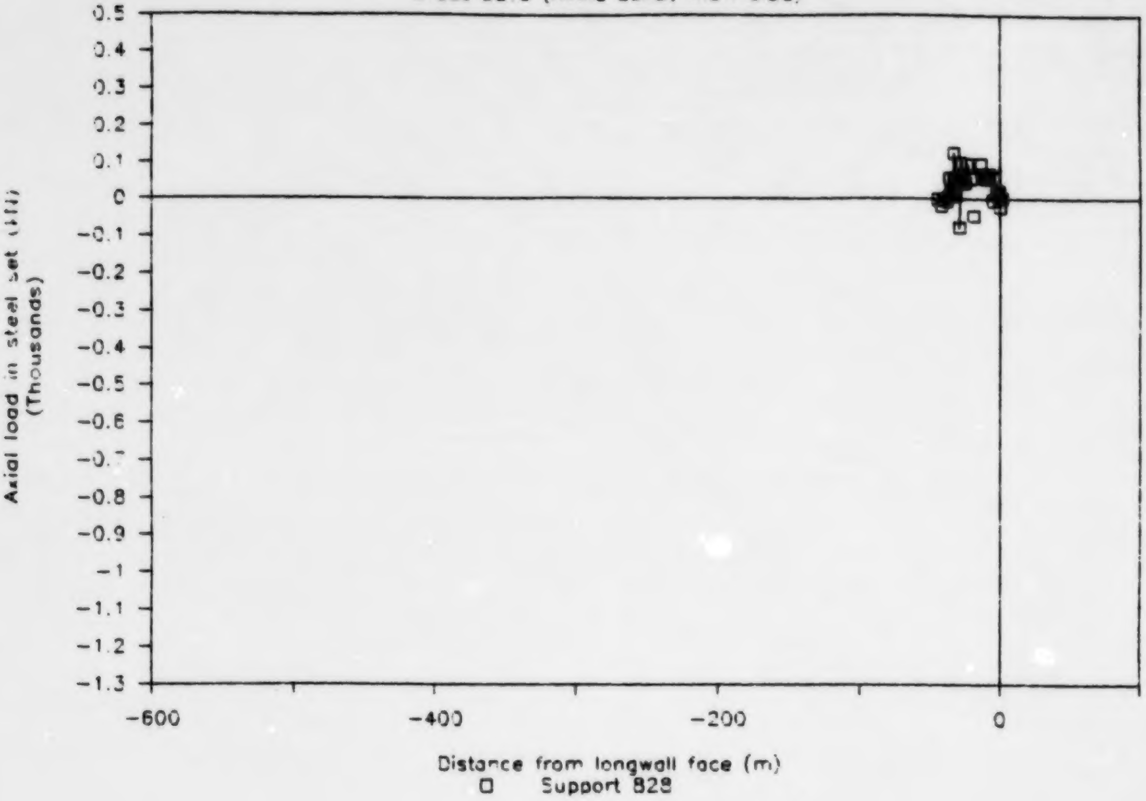
STEEL SETS (AXIAL LOAD, HIGH SIDE)



TEST SITE NO.2, PHALEN MINE

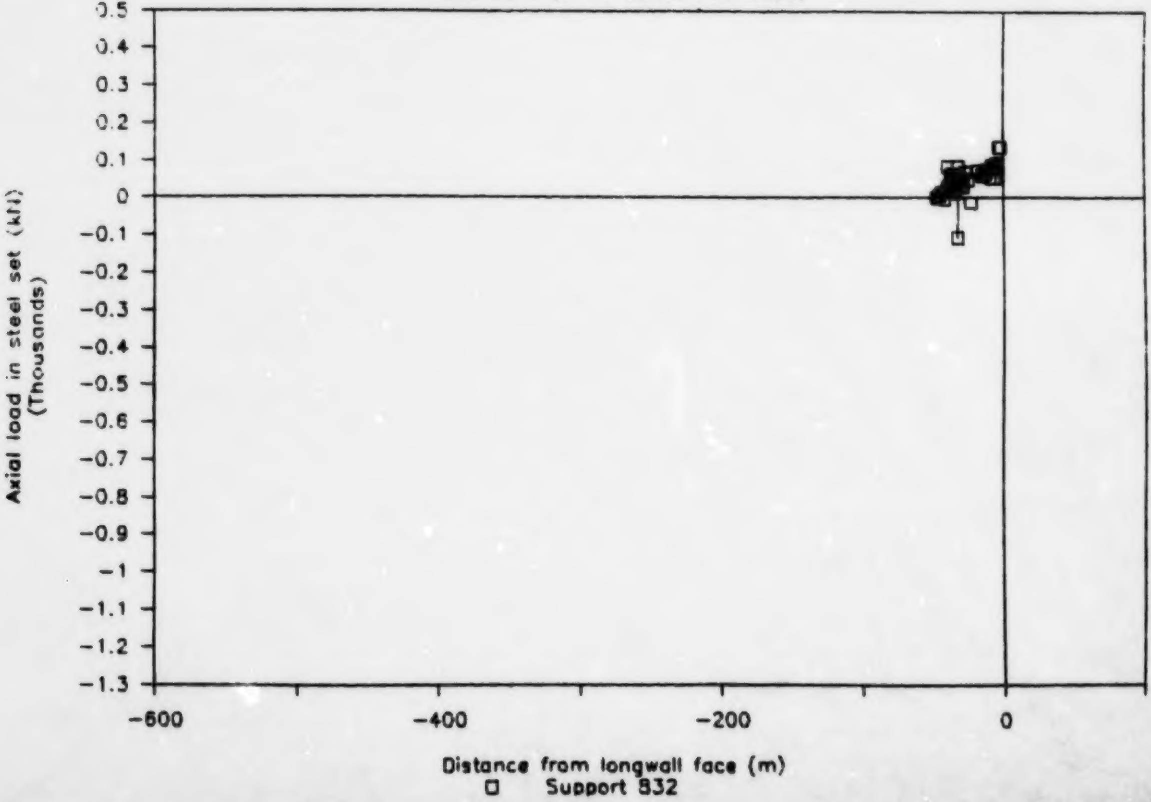
STEEL SETS (AXIAL LOAD, HIGH SIDE)





TEST SITE NO.2, PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)

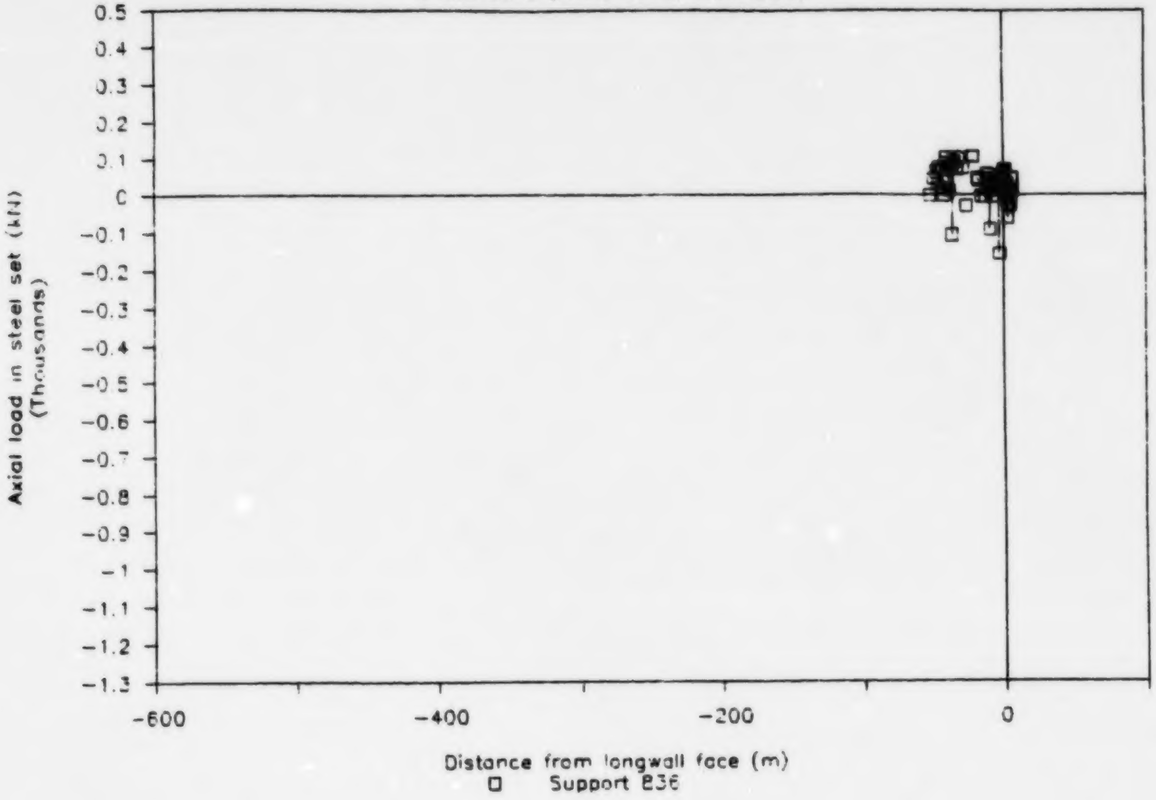


TEST SITE NO.2, PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)

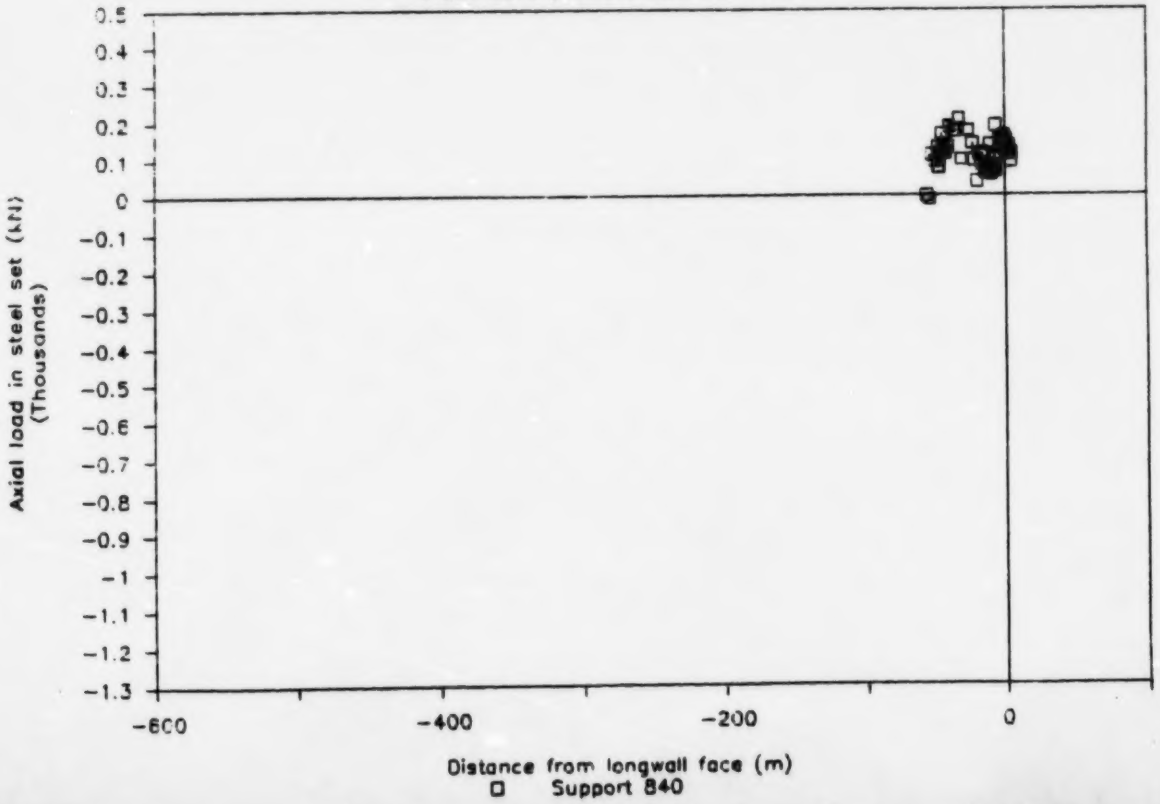
TEST SITE NO.2. PHALEN MINE

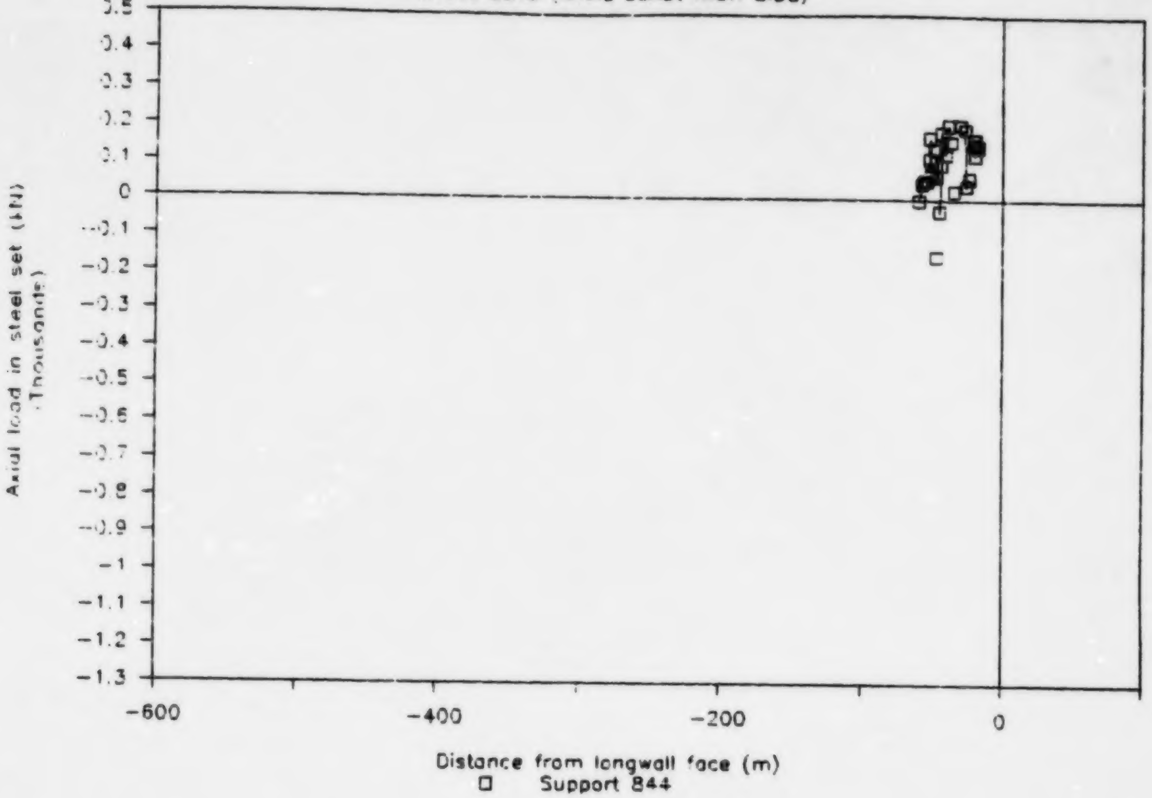
STEEL SETS (AXIAL LOAD, HIGH SIDE)



TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)



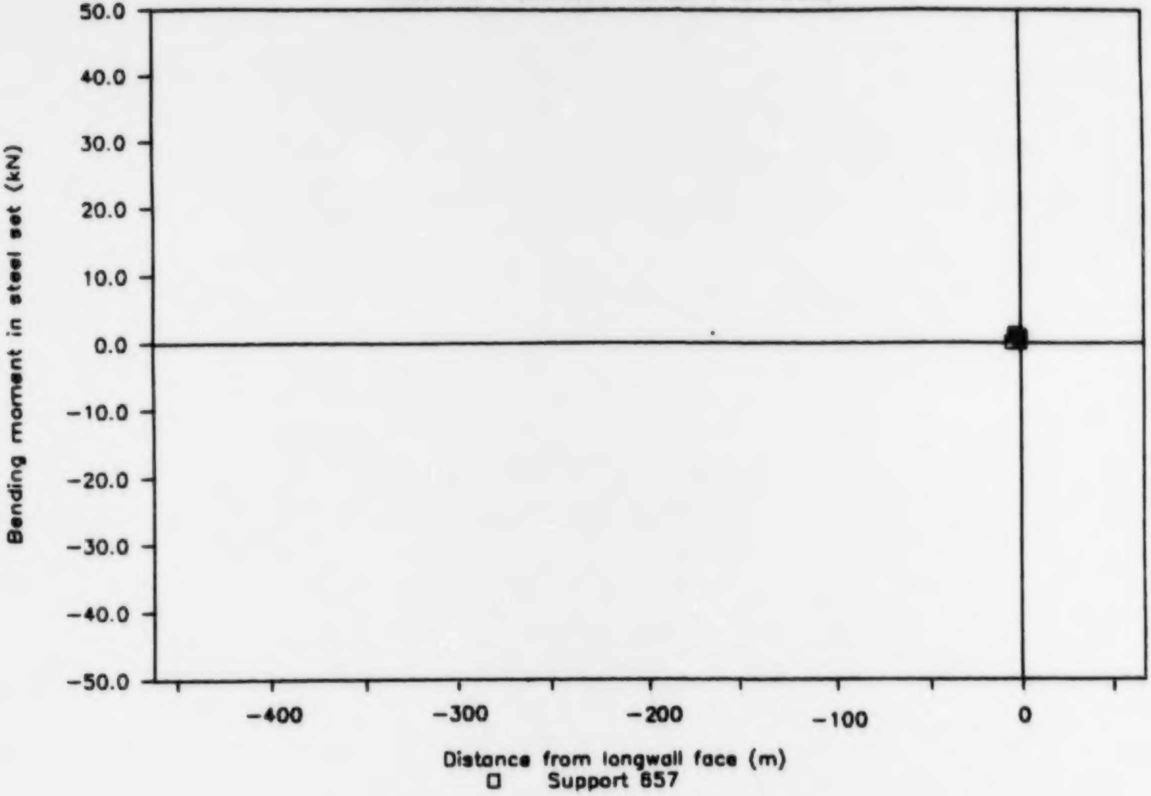


TEST SITE NO.2. PHALEN MINE

STEEL SETS (AXIAL LOAD, HIGH SIDE)

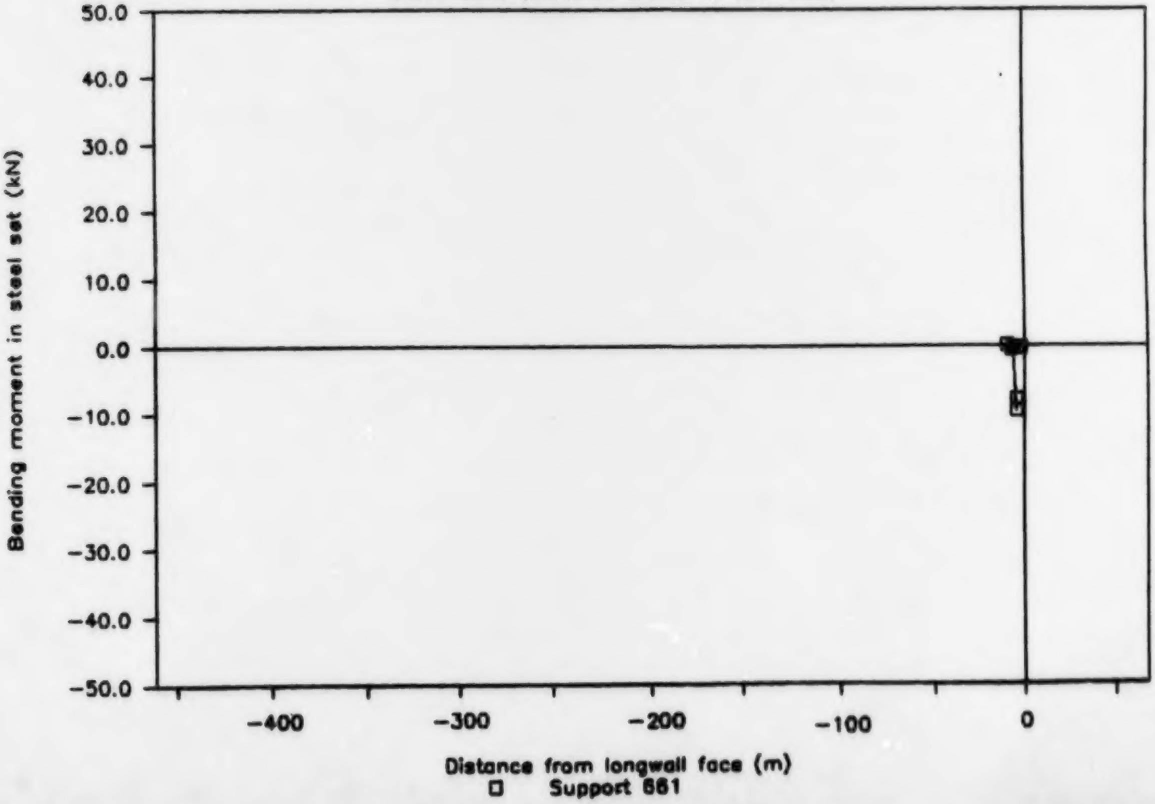
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



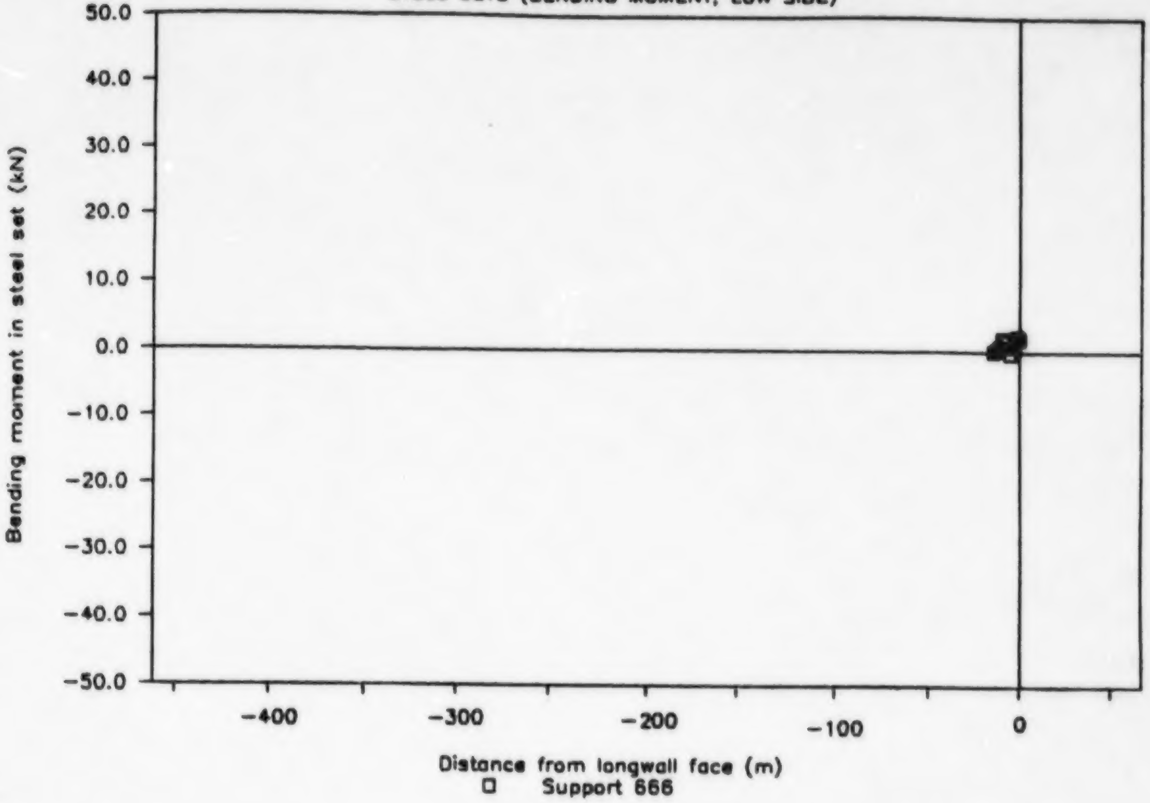
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



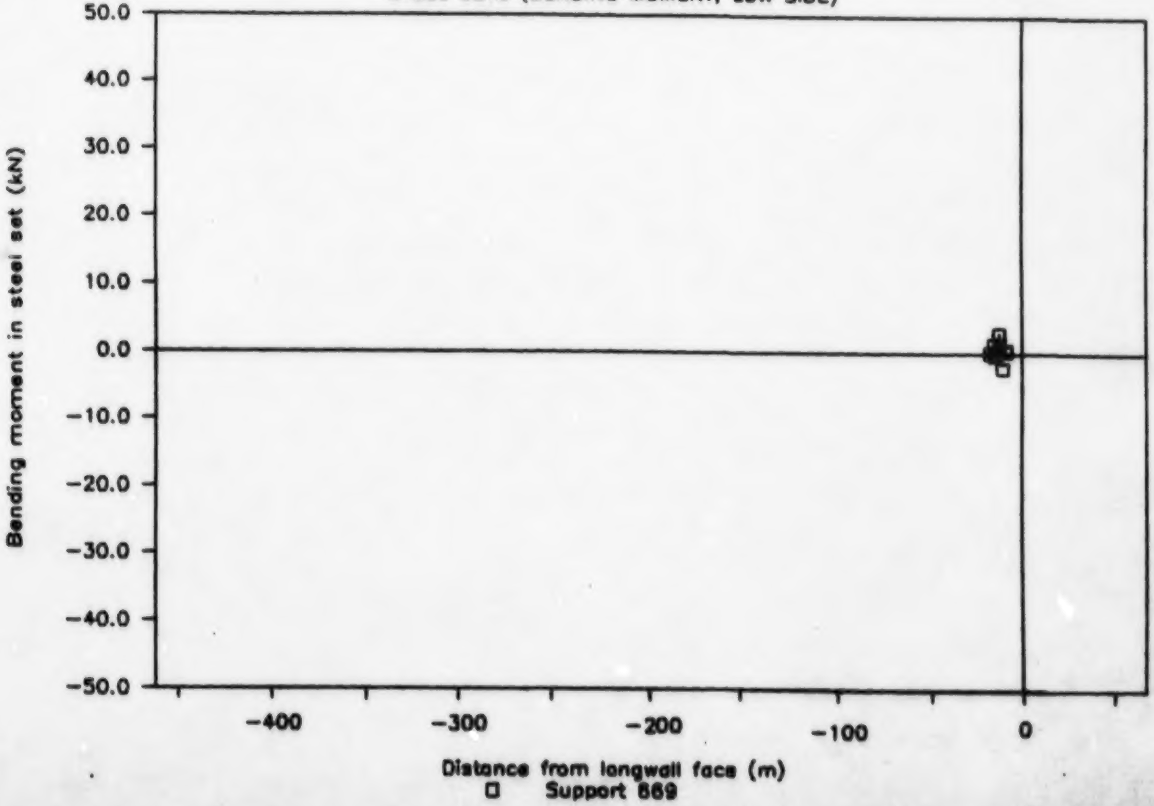
TEST SITE NO.1, PHALEN MINE

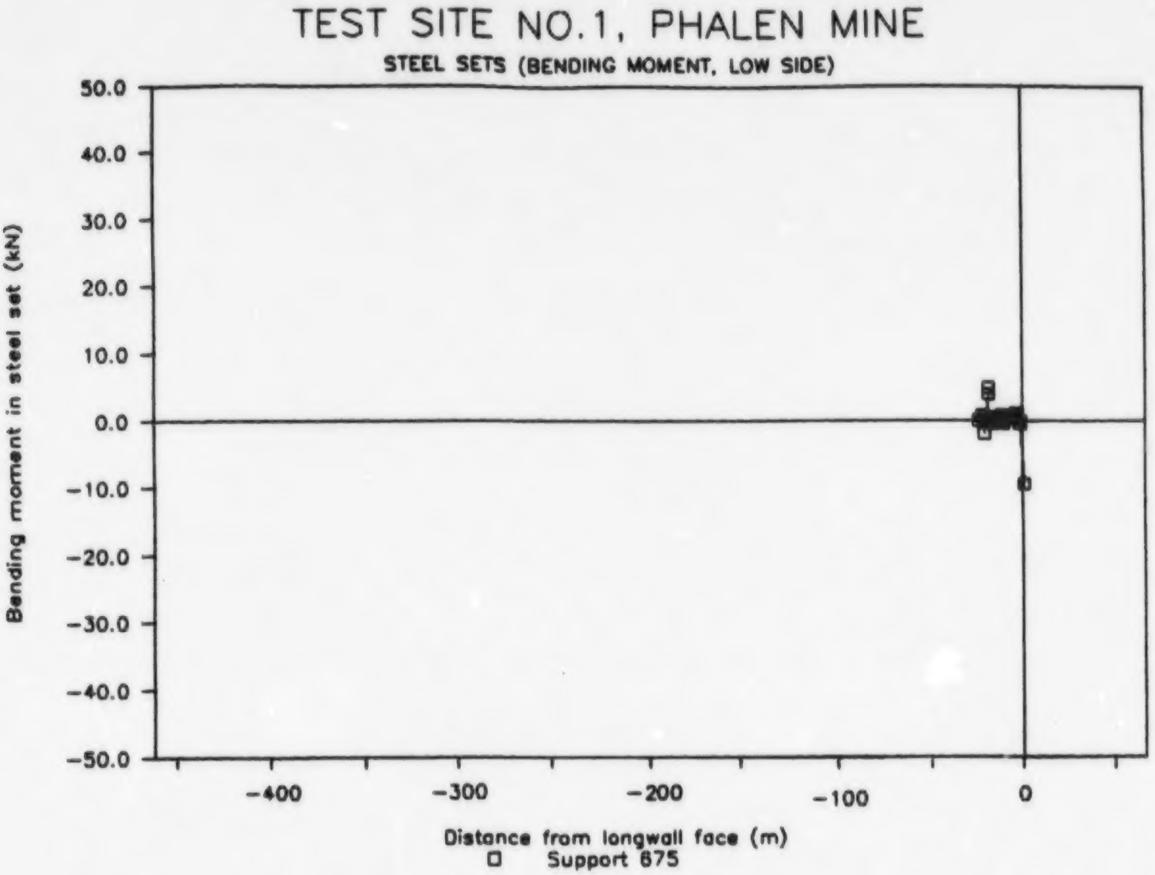
STEEL SETS (BENDING MOMENT, LOW SIDE)

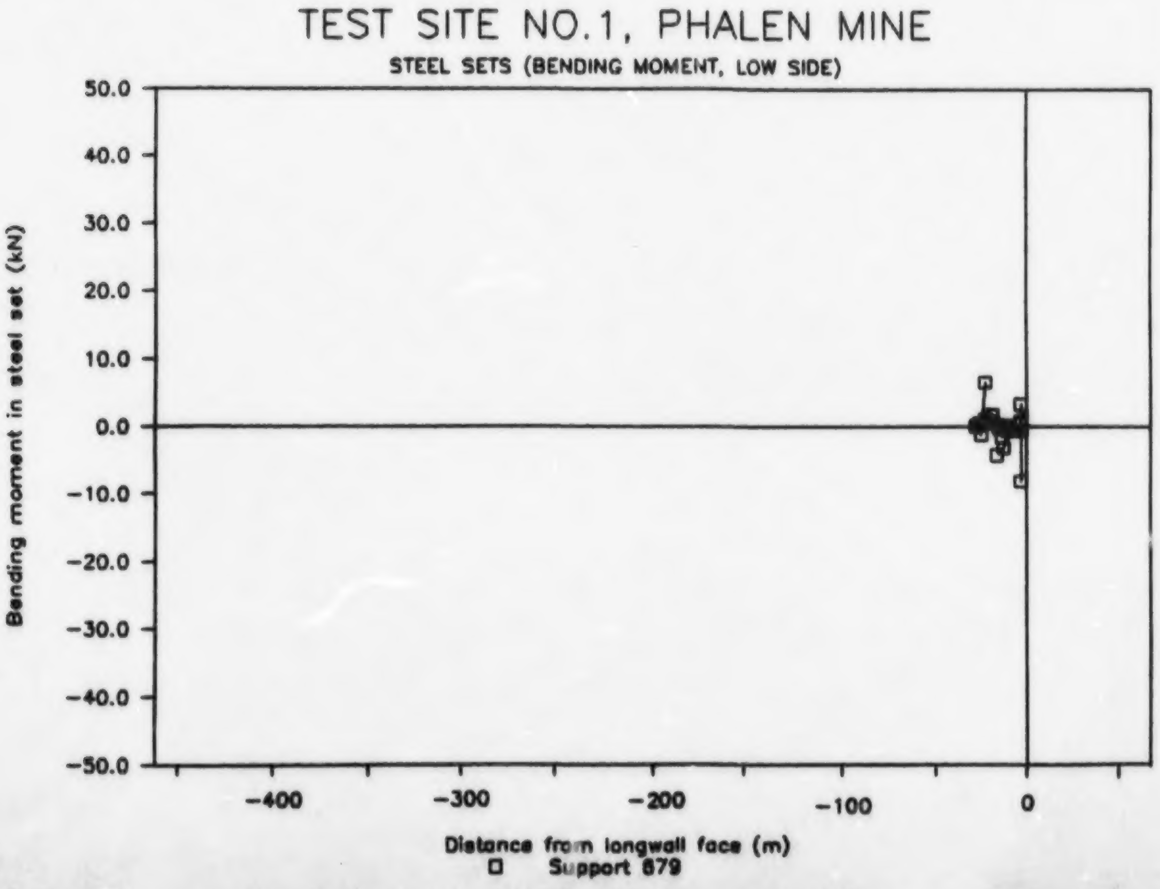


TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)

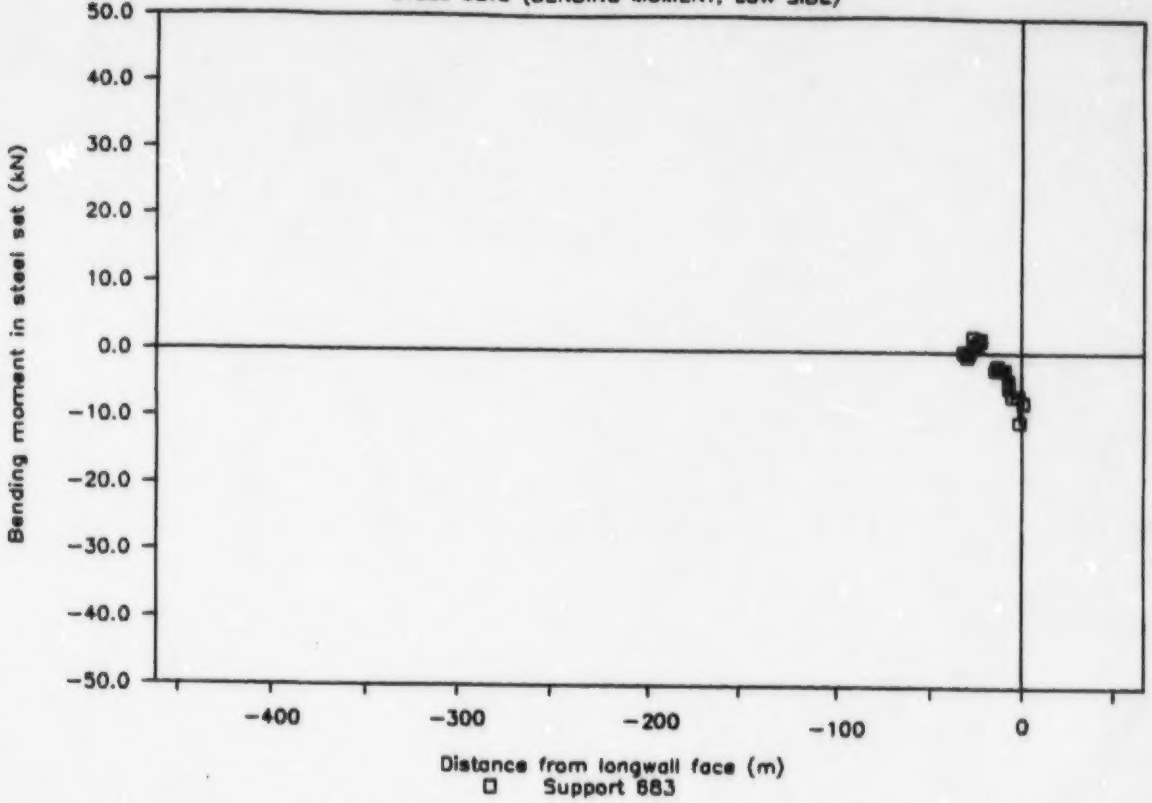



TEST SITE NO.1, PHALEN MINE
STEEL SETS (BENDING MOMENT, LOW SIDE)
Bending moment in steel set (kN)
50.0
40.0
30.0
20.0
10.0
0.0
−10.0
−20.0
−30.0
−40.0
−50.0
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 675


TEST SITE NO.1, PHALEN MINE
STEEL SETS (BENDING MOMENT, LOW SIDE)
Bending moment in steel set (kN)
50.0
40.0
30.0
20.0
10.0
0.0
−10.0
−20.0
−30.0
−40.0
−50.0
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 679

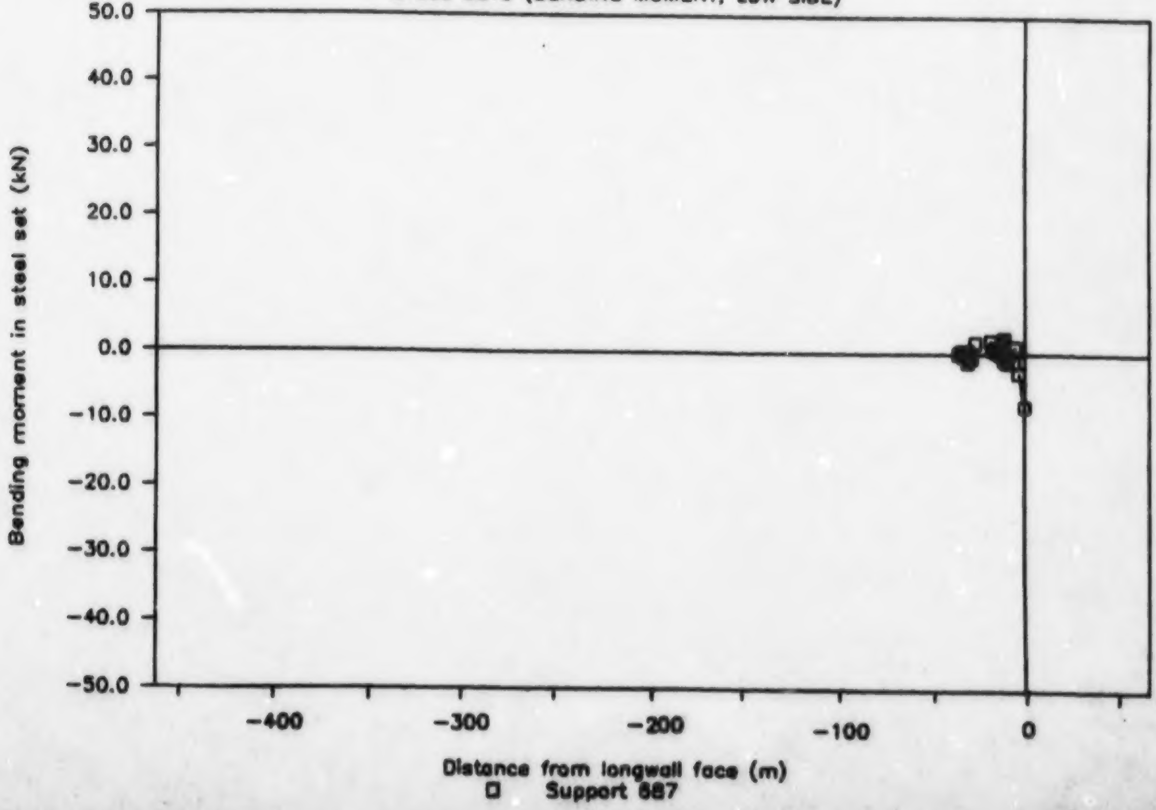
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



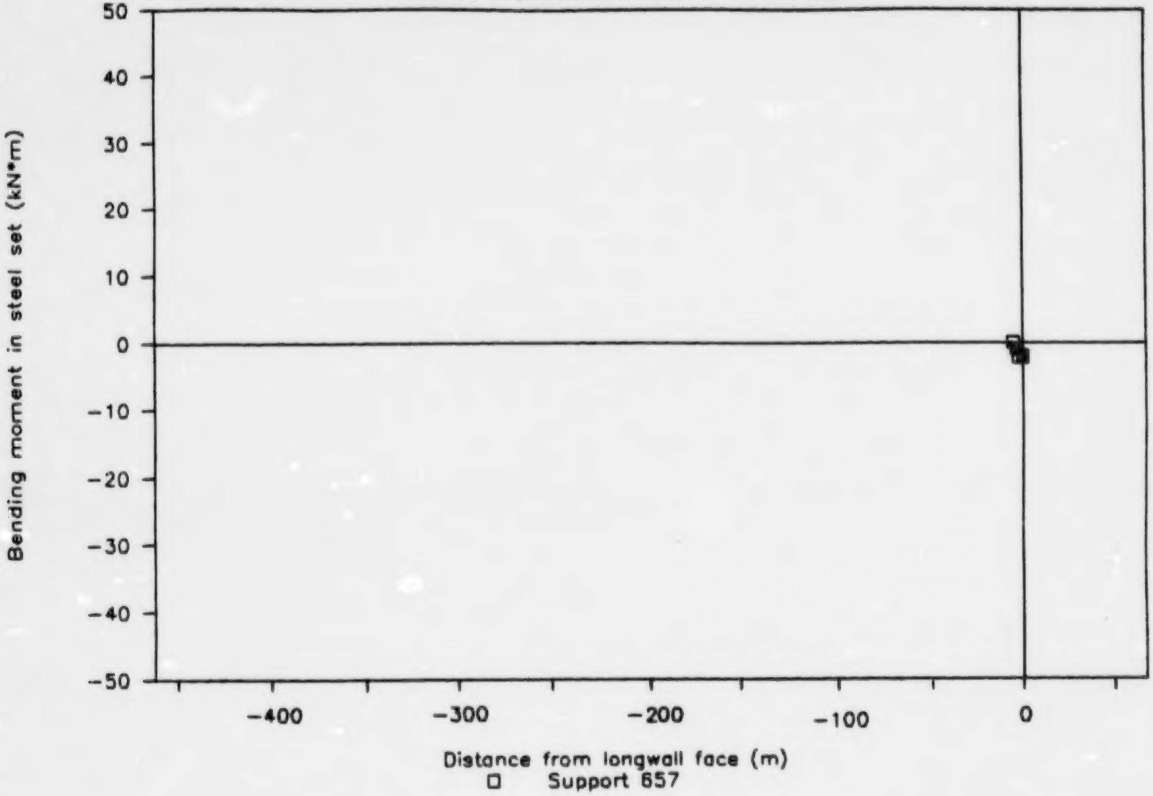
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



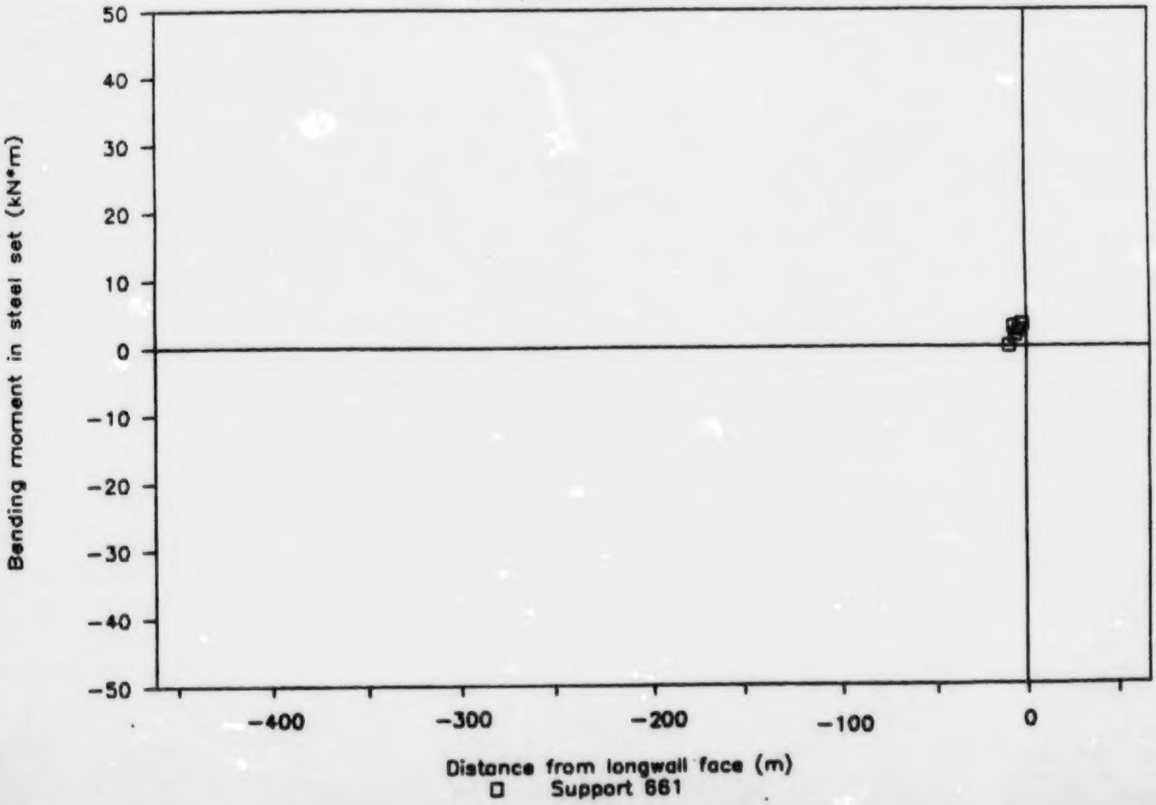
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)



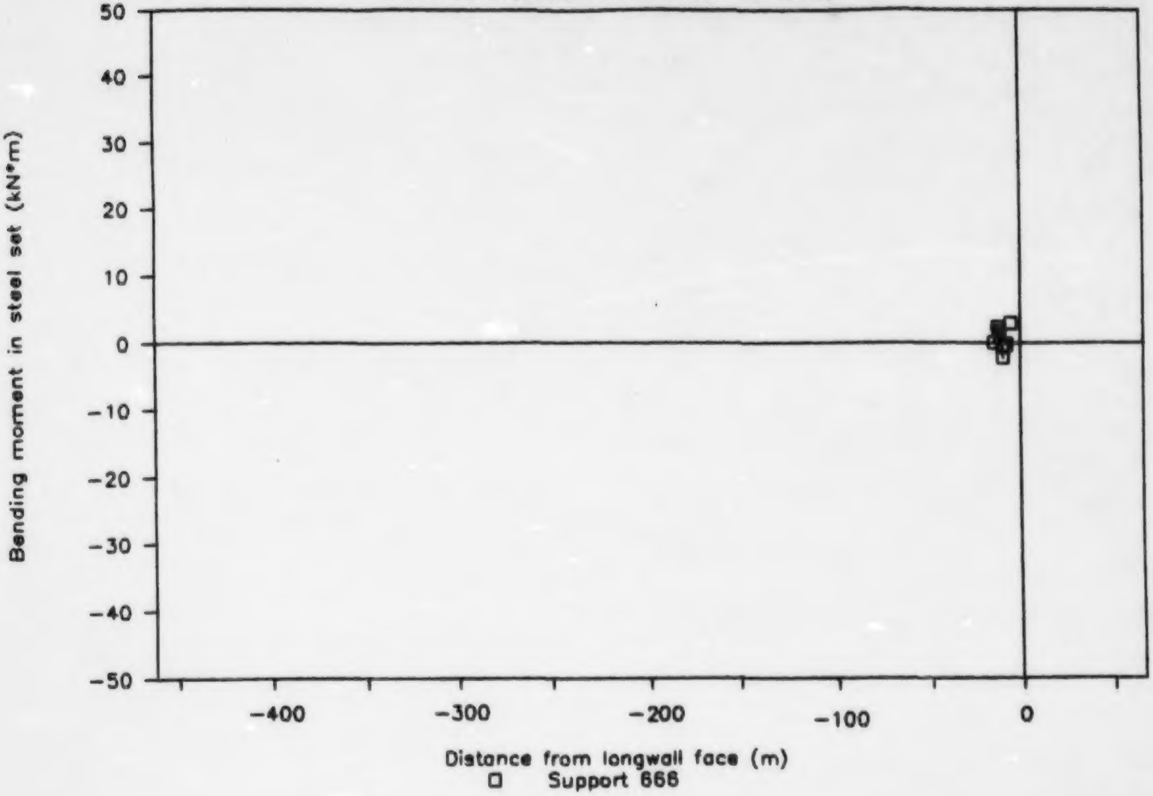
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)



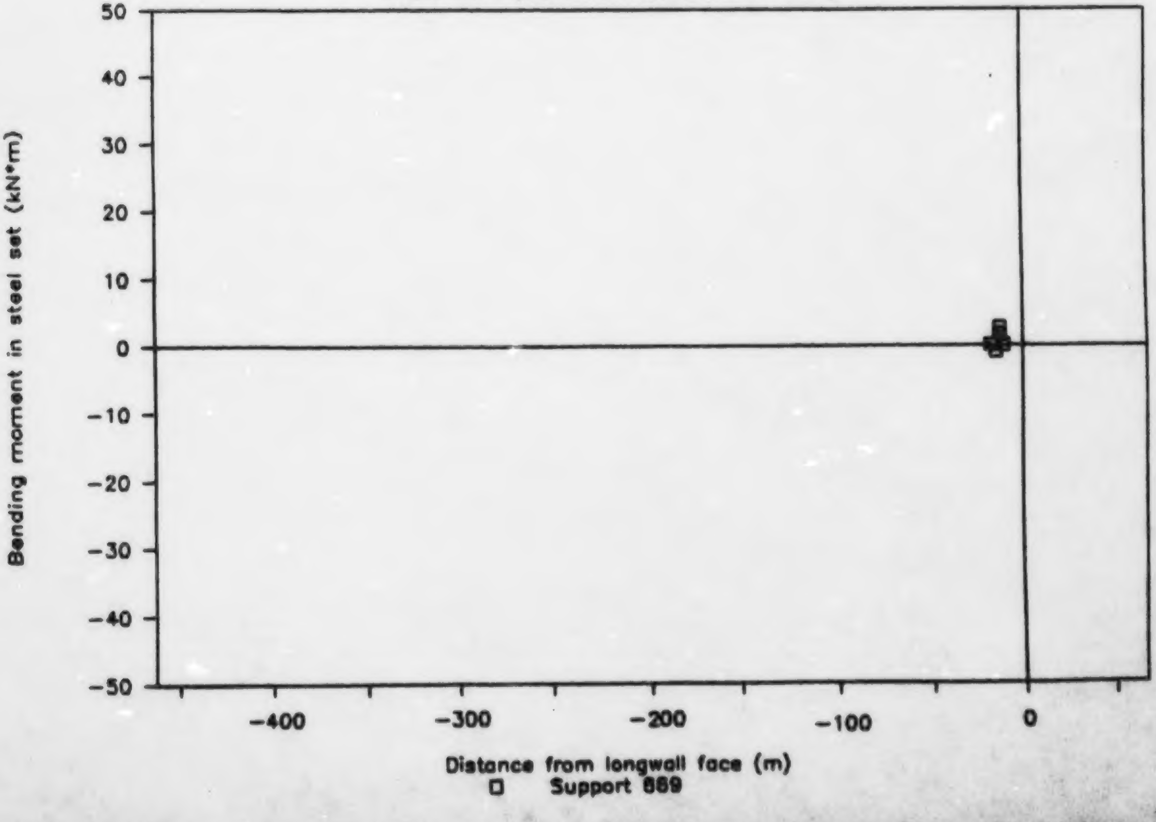
TEST SITE NO.1, PHALEN MINE

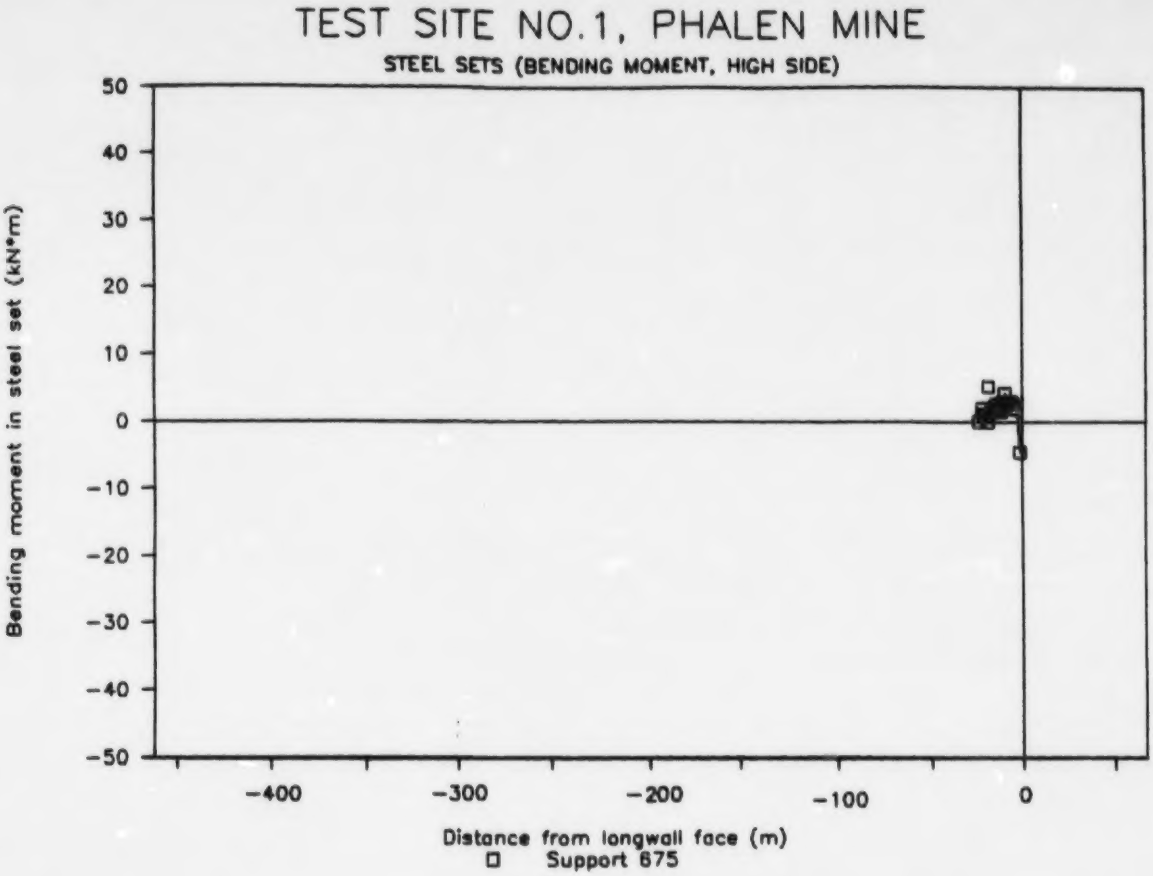
STEEL SETS (BENDING MOMENT, HIGH SIDE)

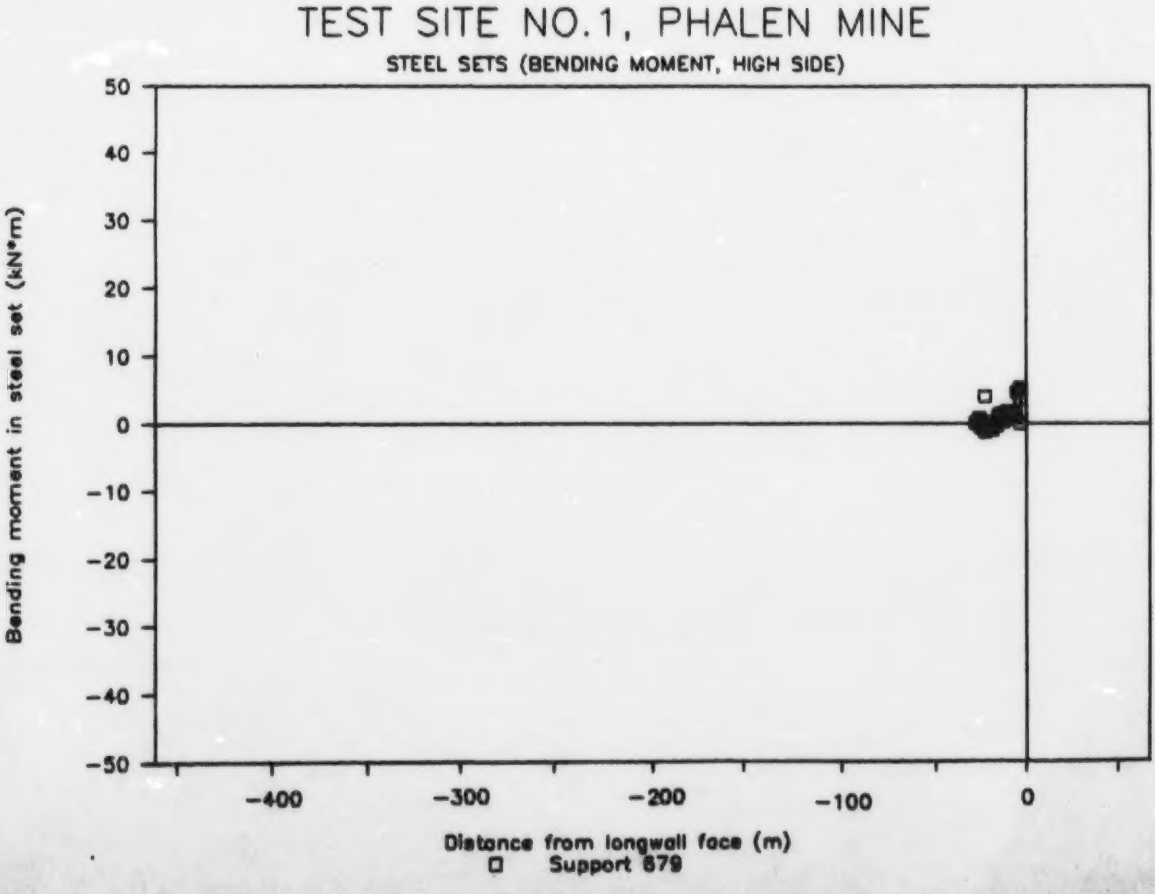


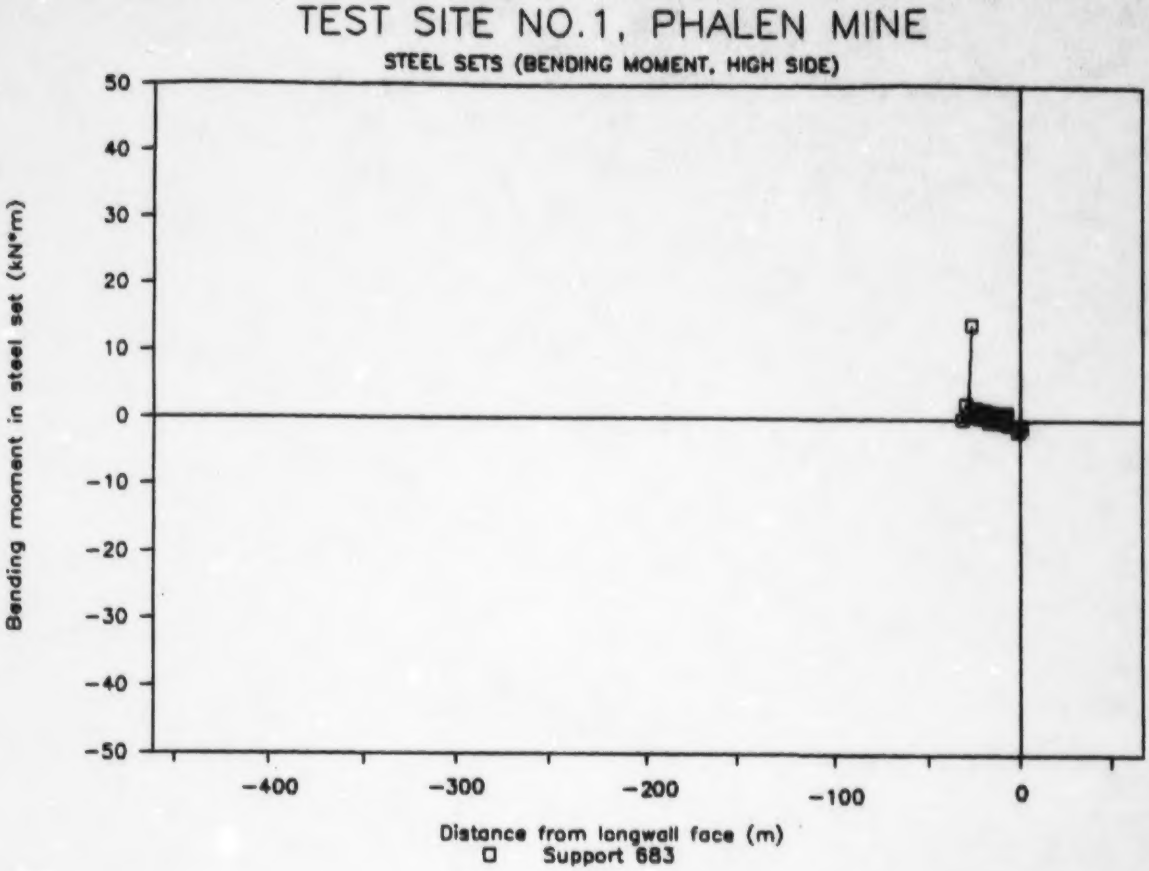
TEST SITE NO.1, PHALEN MINE

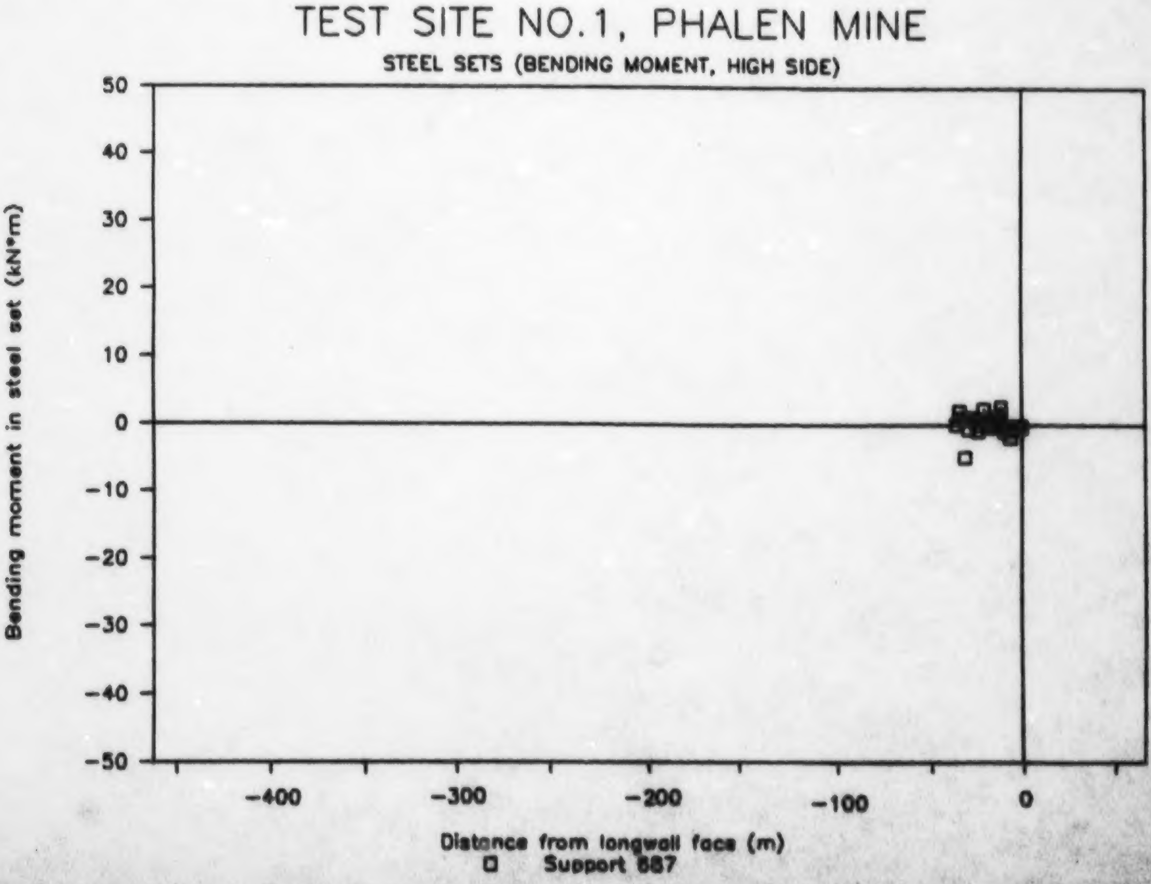
STEEL SETS (BENDING MOMENT, HIGH SIDE)




TEST SITE NO.1, PHALEN MINE
STEEL SETS (BENDING MOMENT, HIGH SIDE)
Bending moment in steel set (kN*m)
50
40
30
20
10
0
−10
−20
−30
−40
−50
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 675

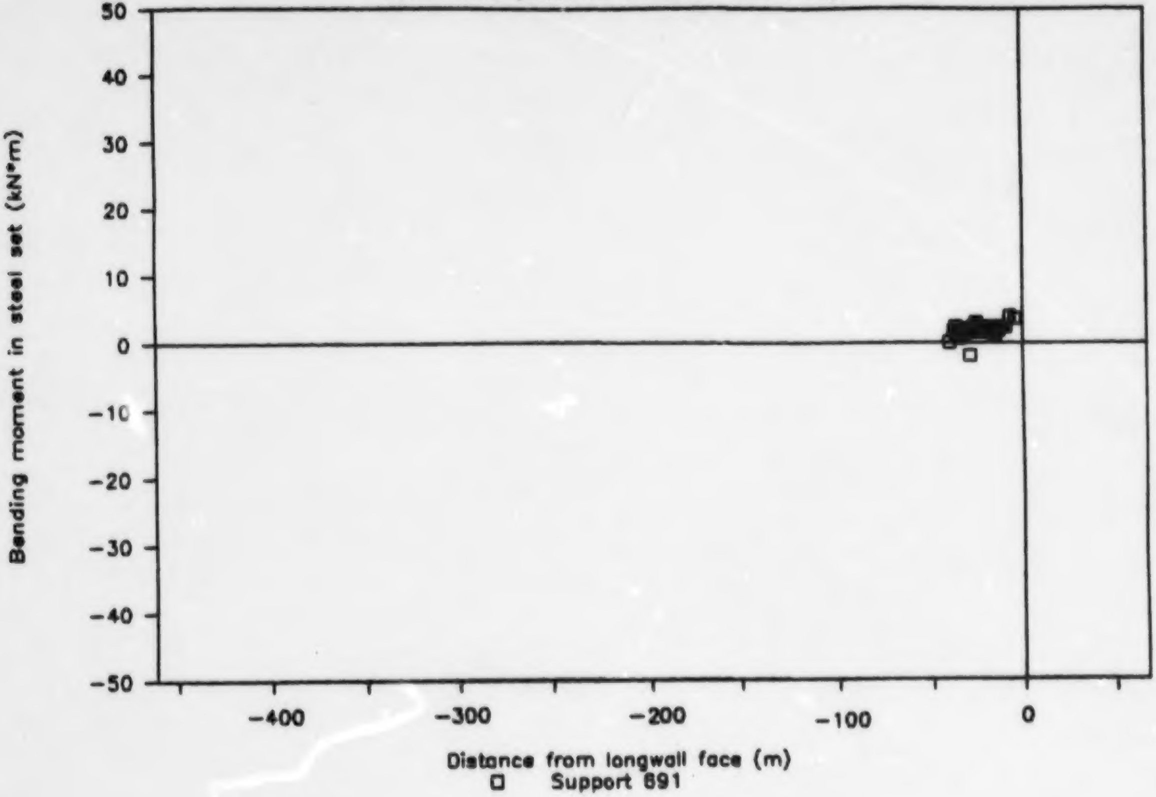

TEST SITE NO.1, PHALEN MINE
STEEL SETS (BENDING MOMENT, HIGH SIDE)
Bending moment in steel set (kN*m)
50
40
30
20
10
0
−10
−20
−30
−40
−50
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 679


TEST SITE NO.1, PHALEN MINE
STEEL SETS (BENDING MOMENT, HIGH SIDE)
Bending moment in steel set (kN*m)
50
40
30
20
10
0
−10
−20
−30
−40
−50
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 683


TEST SITE NO.1, PHALEN MINE
STEEL SETS (BENDING MOMENT, HIGH SIDE)
Bending moment in steel set (kN*m)
50
40
30
20
10
0
−10
−20
−30
−40
−50
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 687

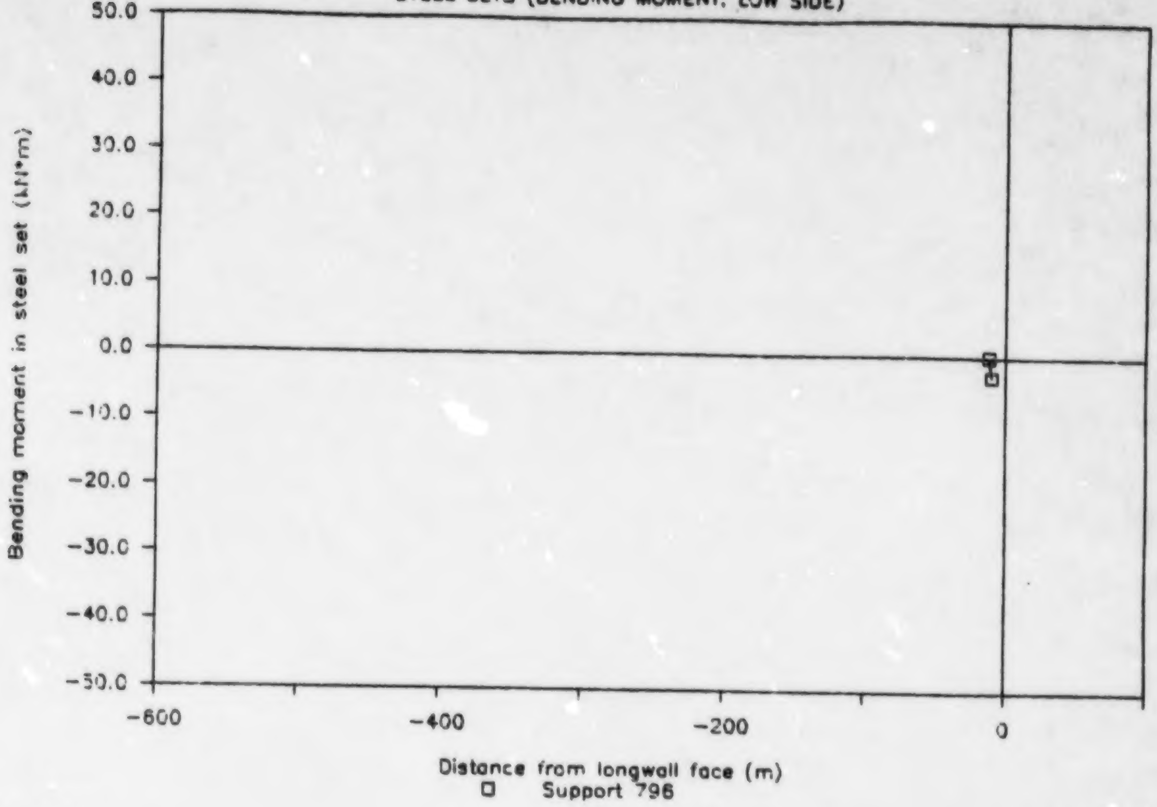
TEST SITE NO.1, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)



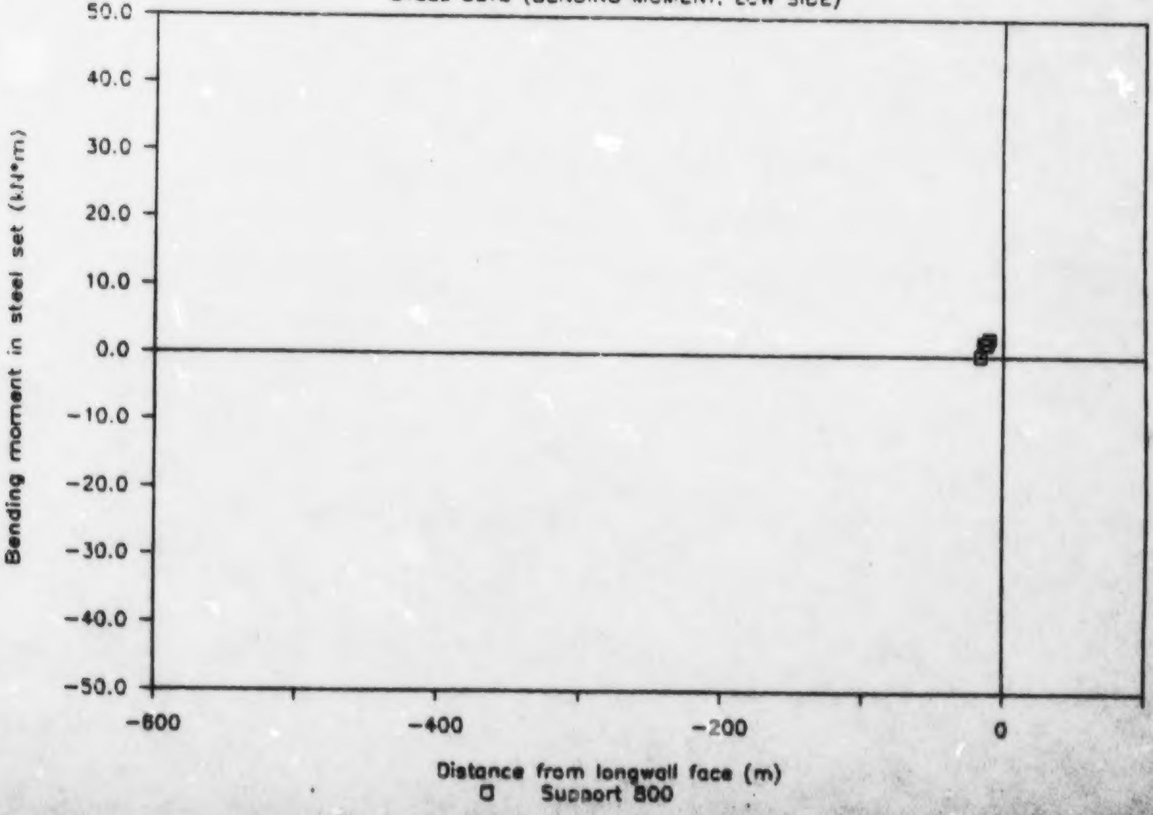
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



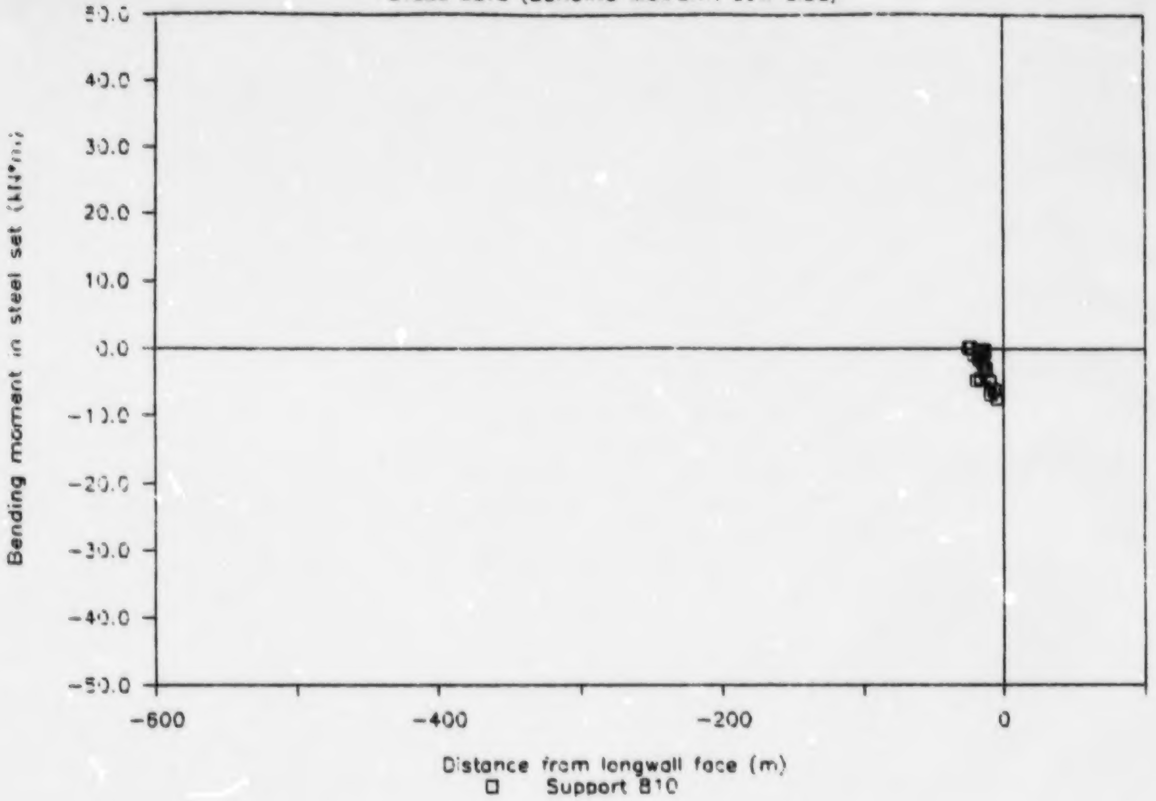
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



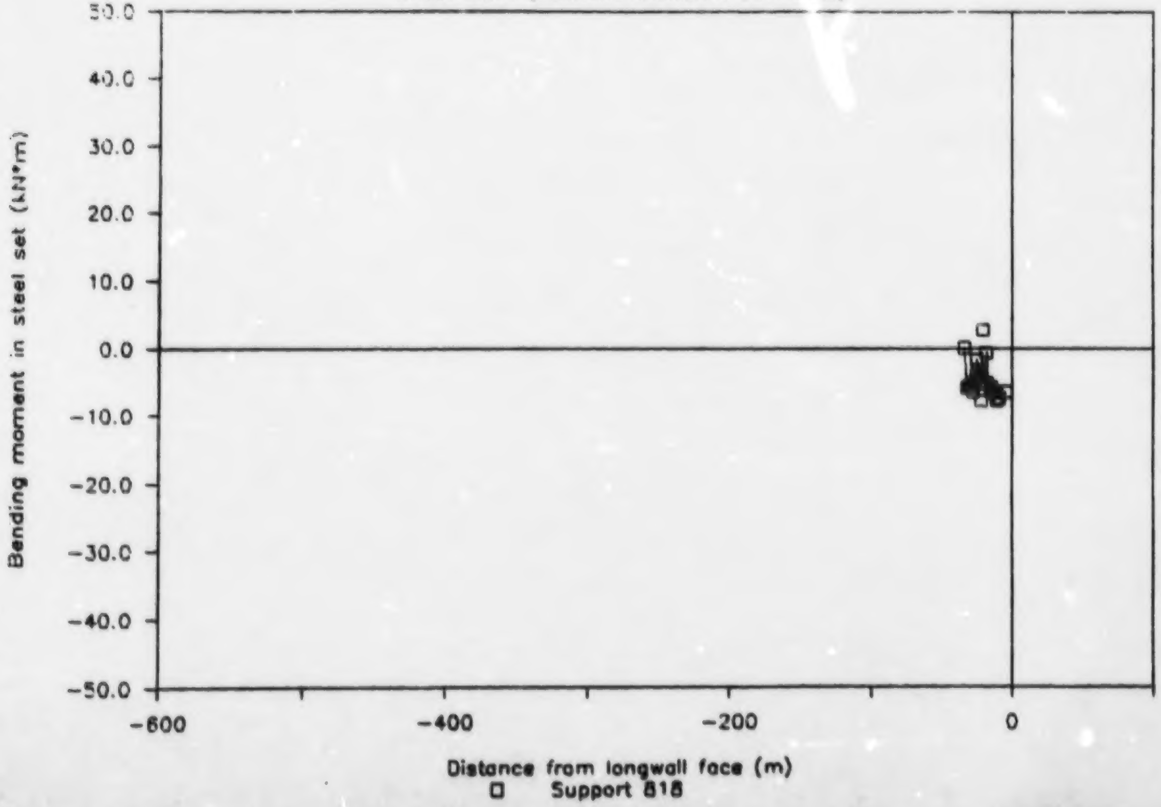
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



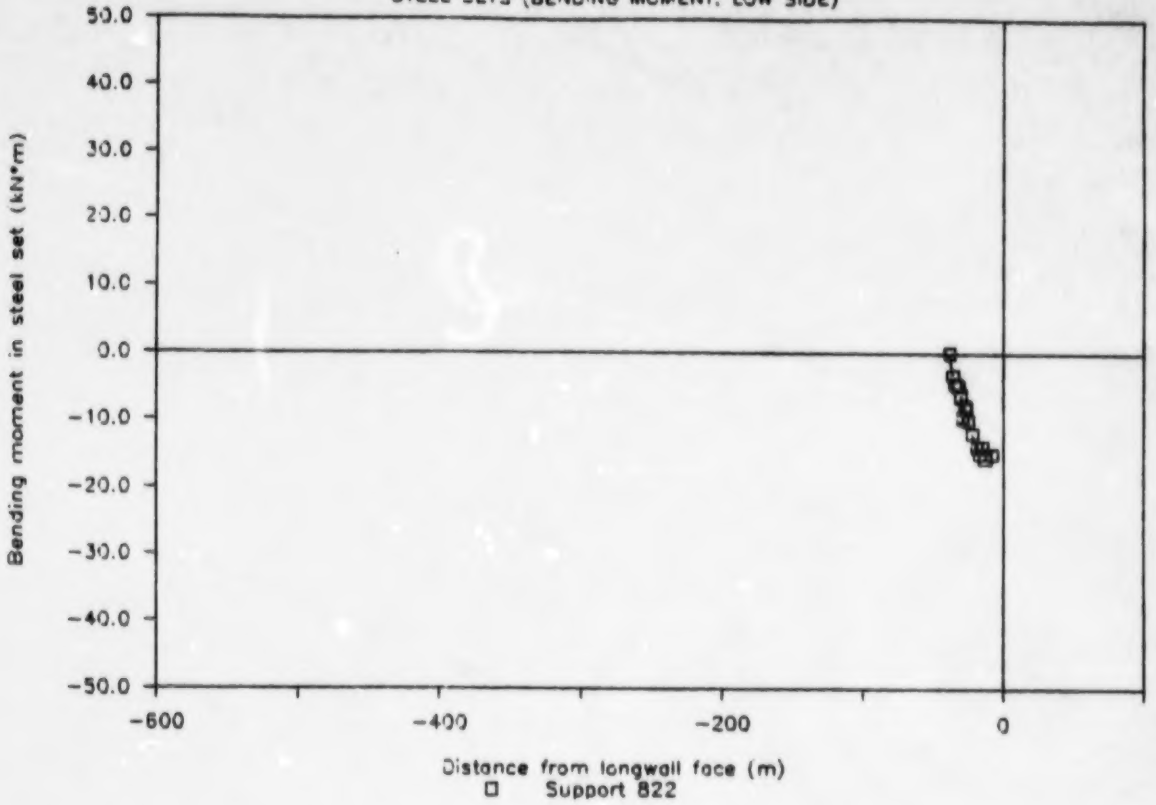
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



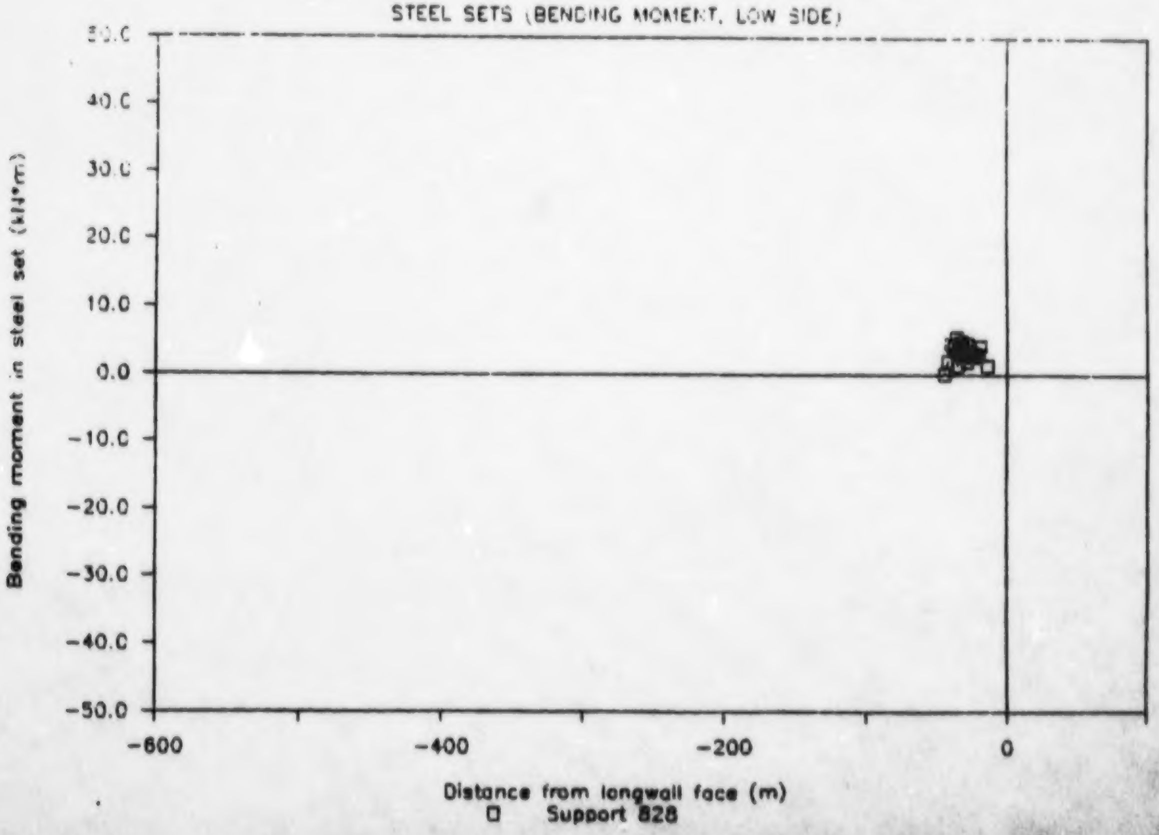
TEST SITE NO.2, PHALEN MINE

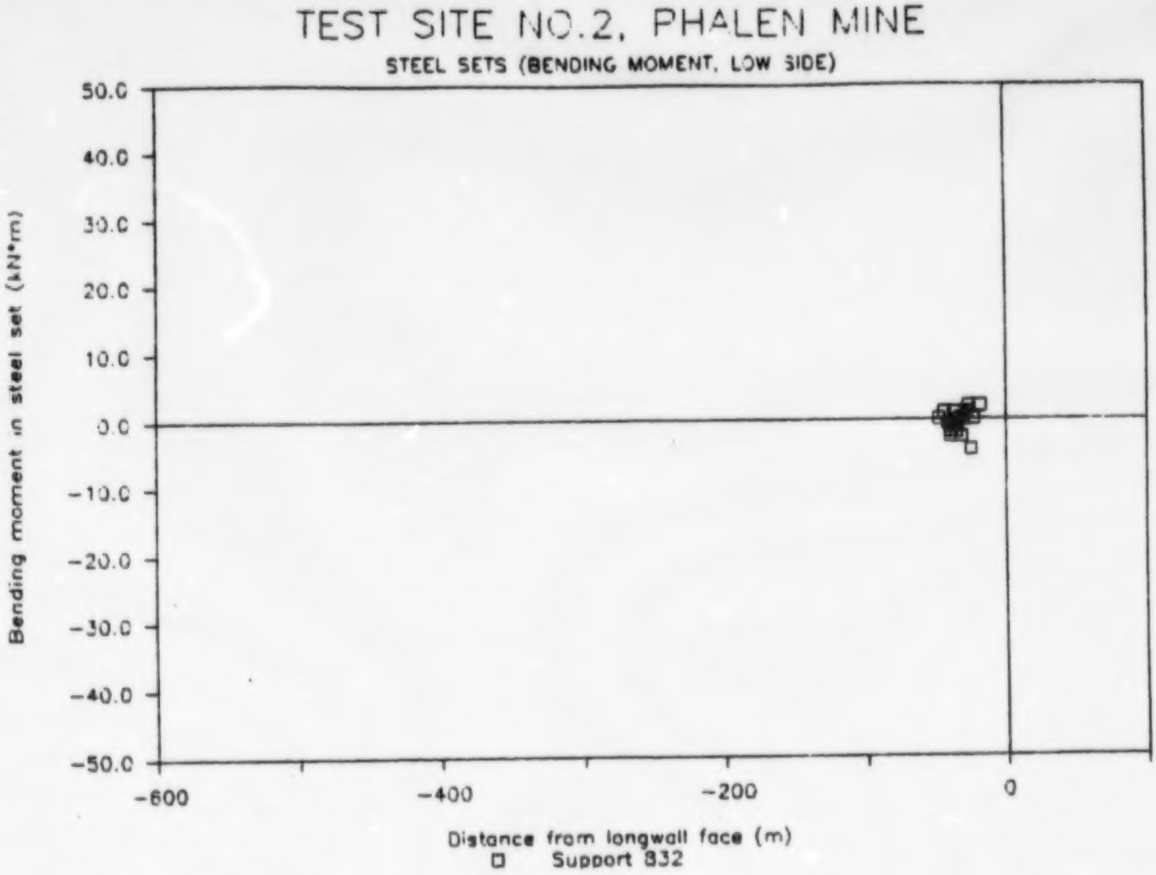
STEEL SETS (BENDING MOMENT, LOW SIDE)

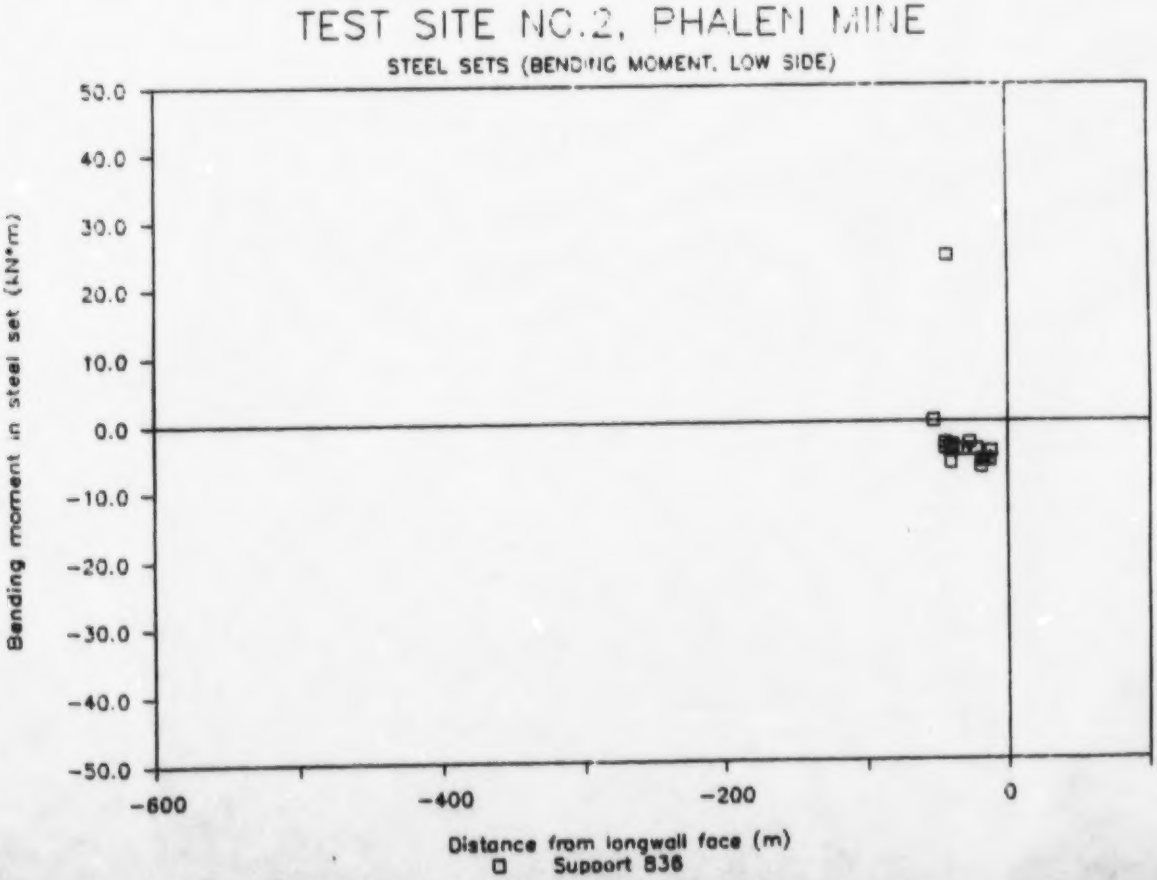


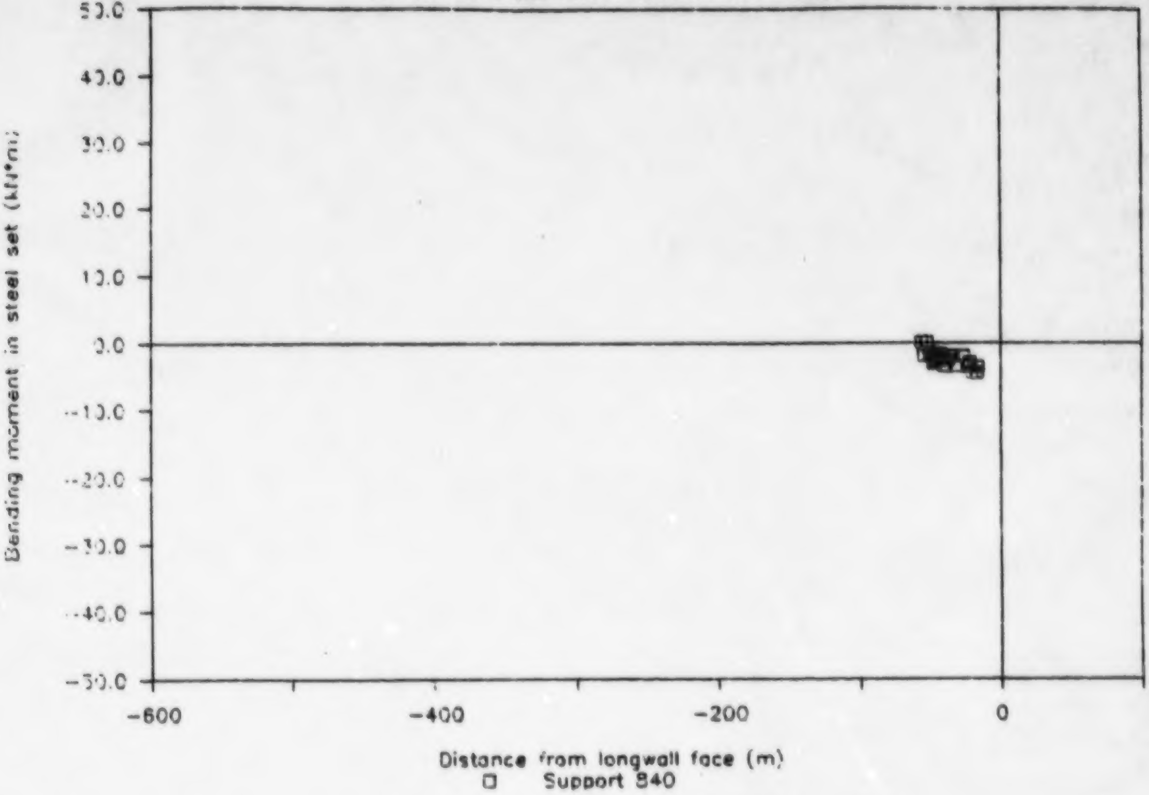
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



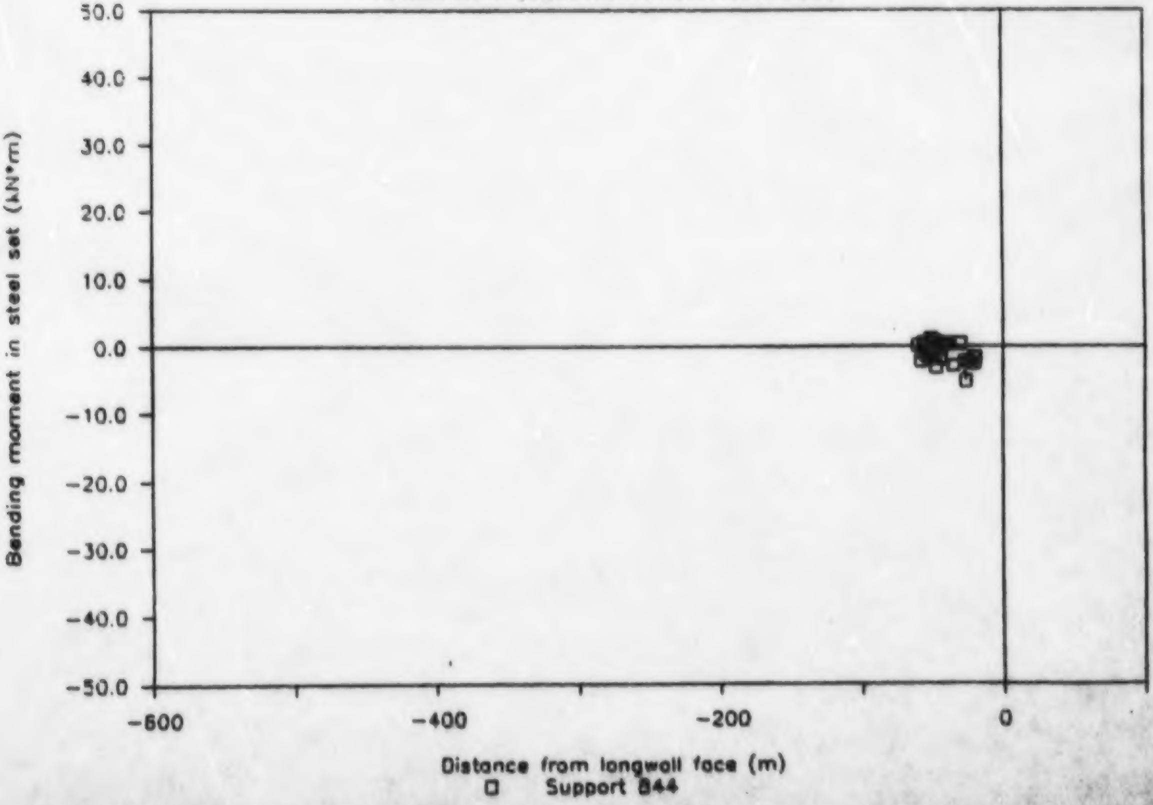

TEST SITE NO.2, PHALEN MINE
STEEL SETS (BENDING MOMENT, LOW SIDE)
50.0
40.0
30.0
20.0
10.0
0.0
−10.0
−20.0
−30.0
−40.0
−50.0
Bending moment in steel set (kN•m)
−600
−400
−200
0
Distance from longwall face (m)
□ Support 832


TEST SITE NO.2, PHALEN MINE
STEEL SETS (BENDING MOMENT, LOW SIDE)
50.0
40.0
30.0
20.0
10.0
0.0
−10.0
−20.0
−30.0
−40.0
−50.0
Bending moment in steel set (kN•m)
−600
−400
−200
0
Distance from longwall face (m)
□ Support 836



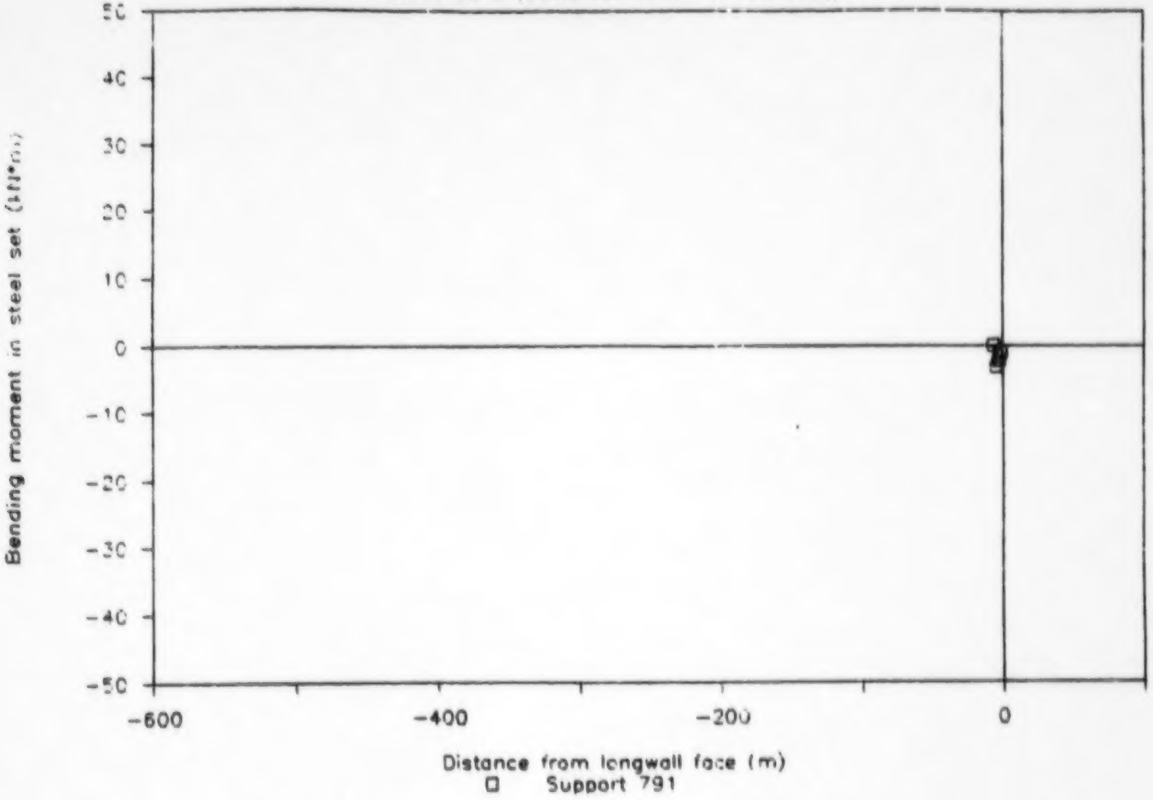
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



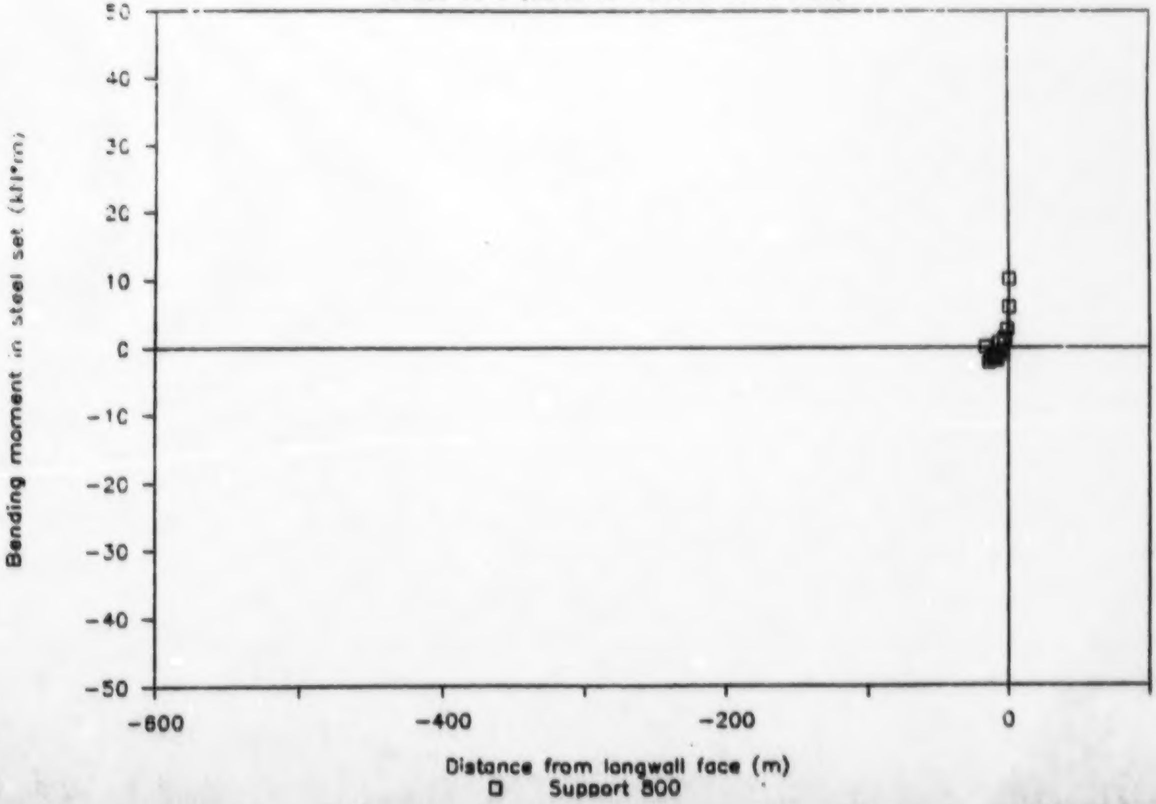
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, LOW SIDE)



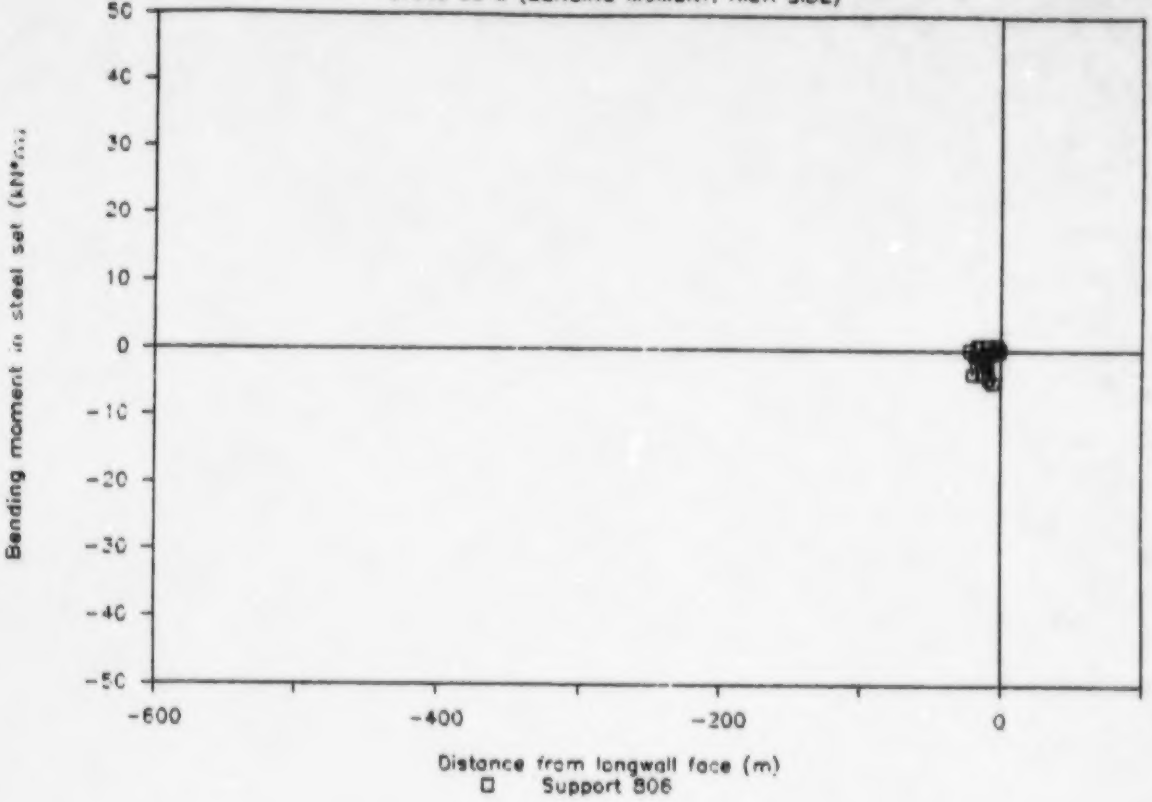
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)

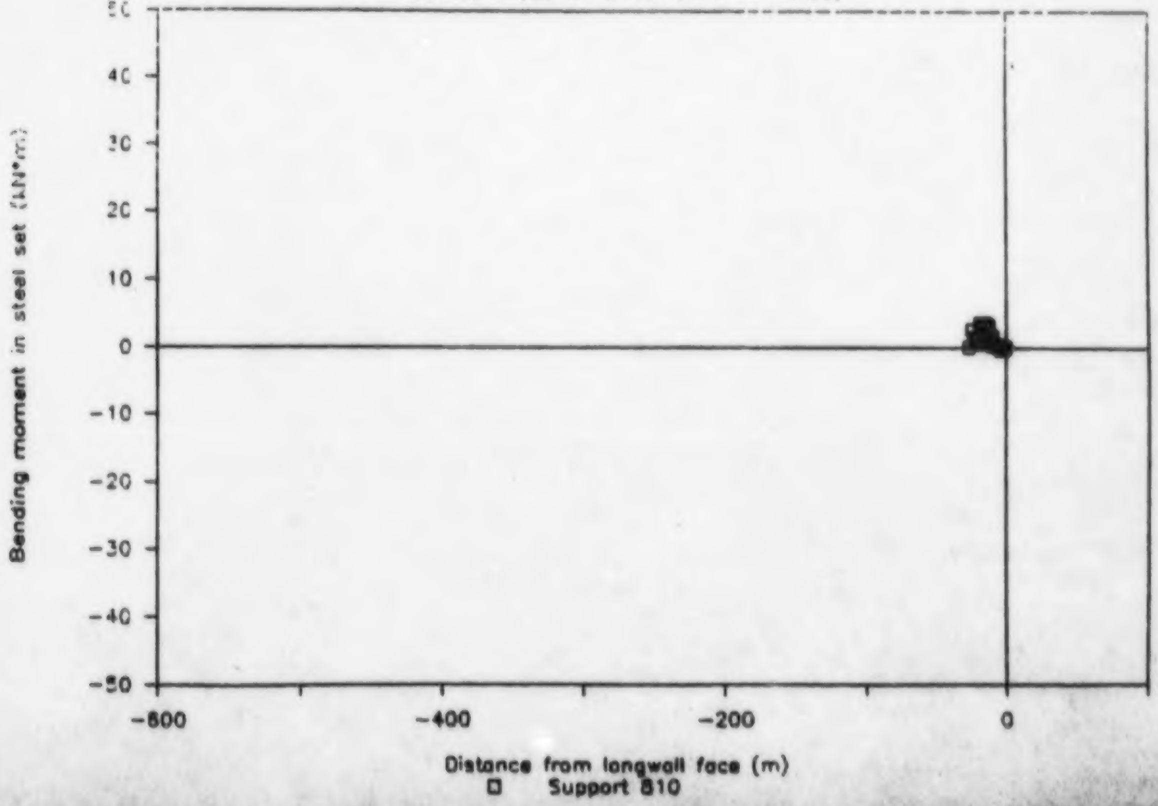


TEST SITE NO.2, PHALEN MINE

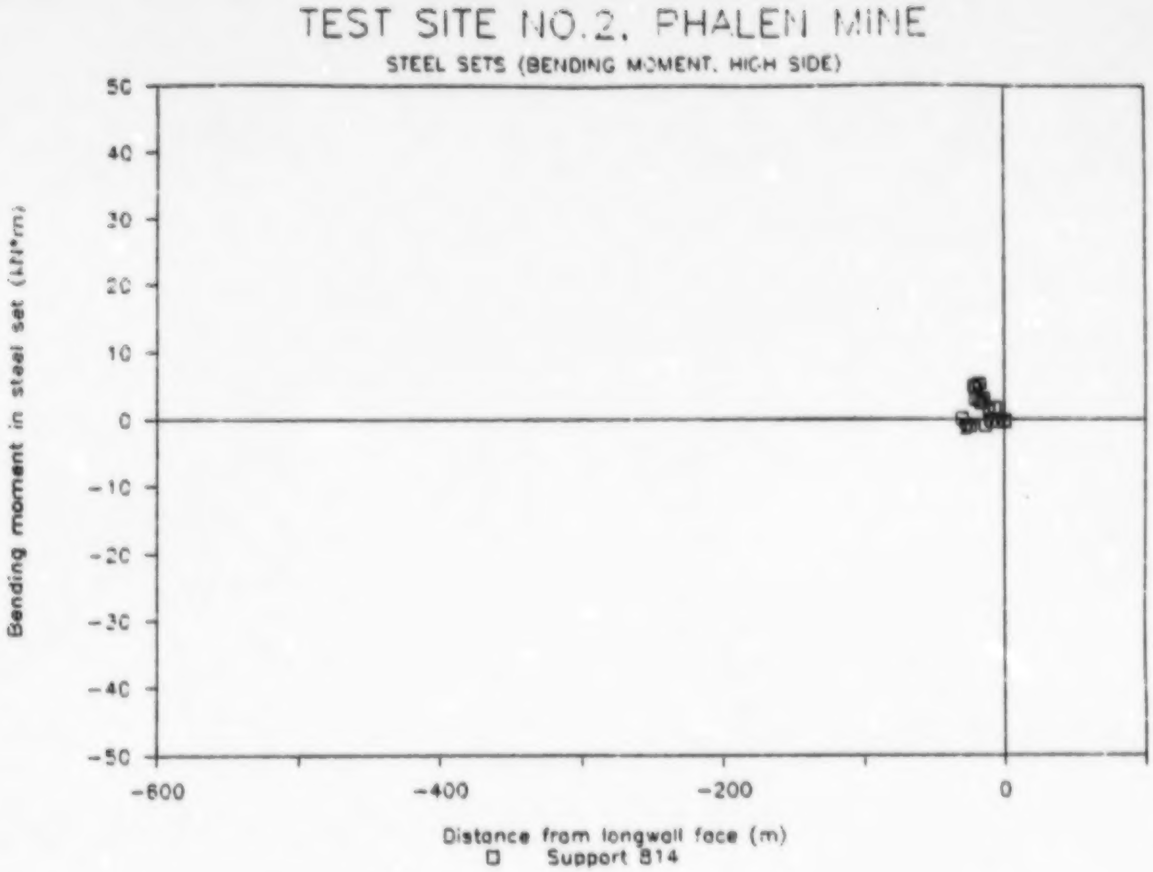
STEEL SETS (BENDING MOMENT, HIGH SIDE)


TEST SITE NO.2. PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)

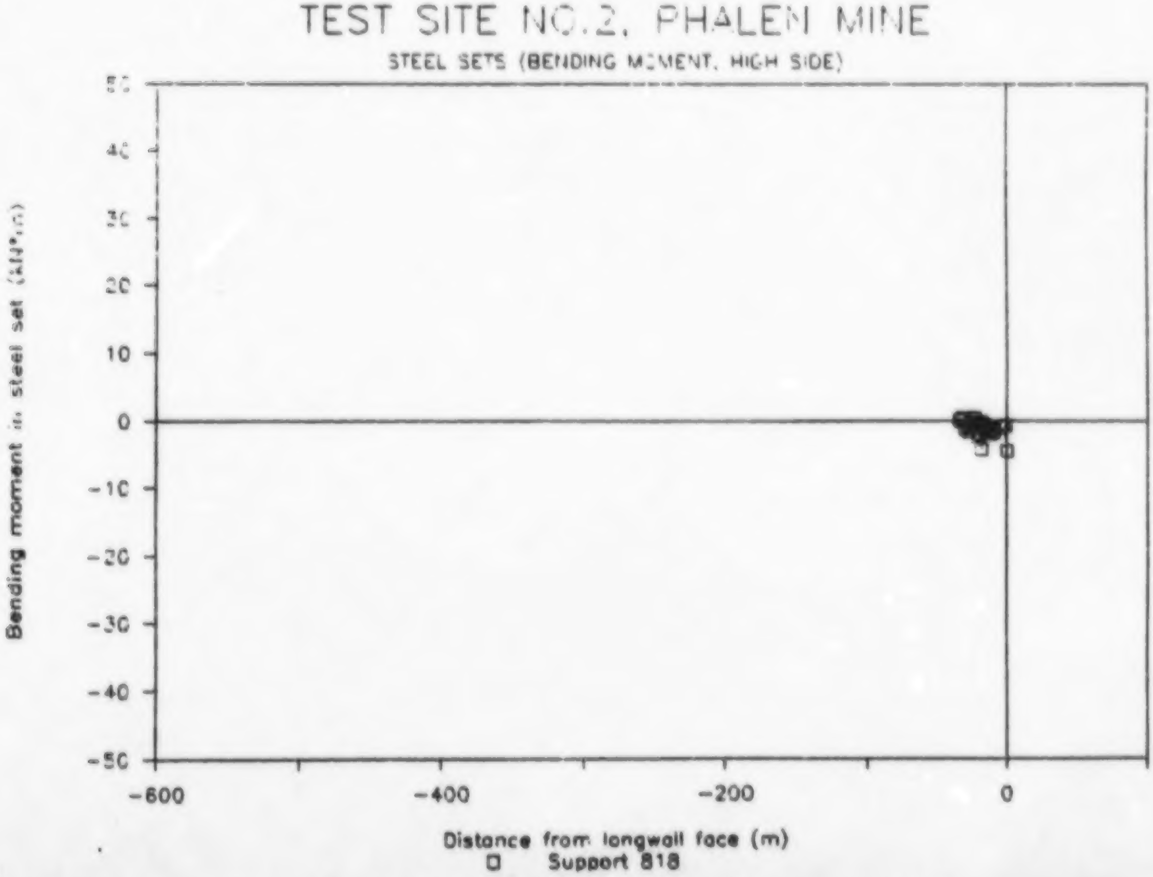

TEST SITE NO.2. PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)



TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)

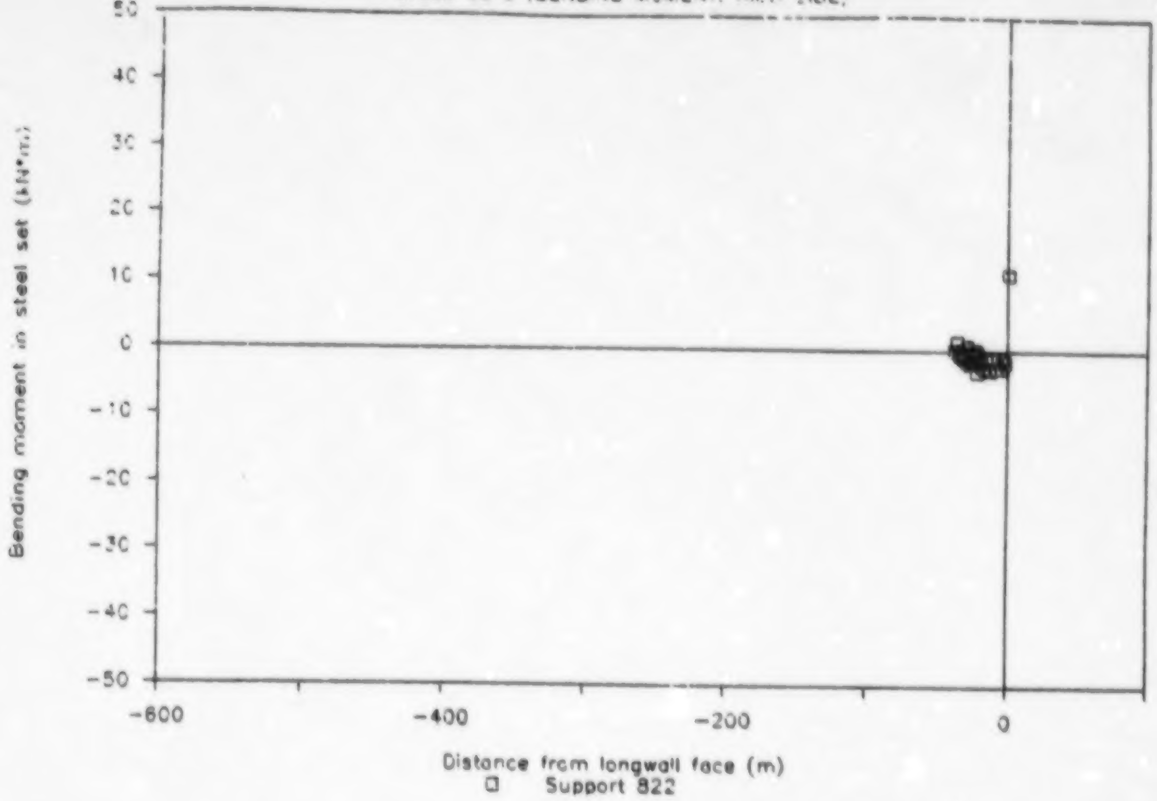


TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)

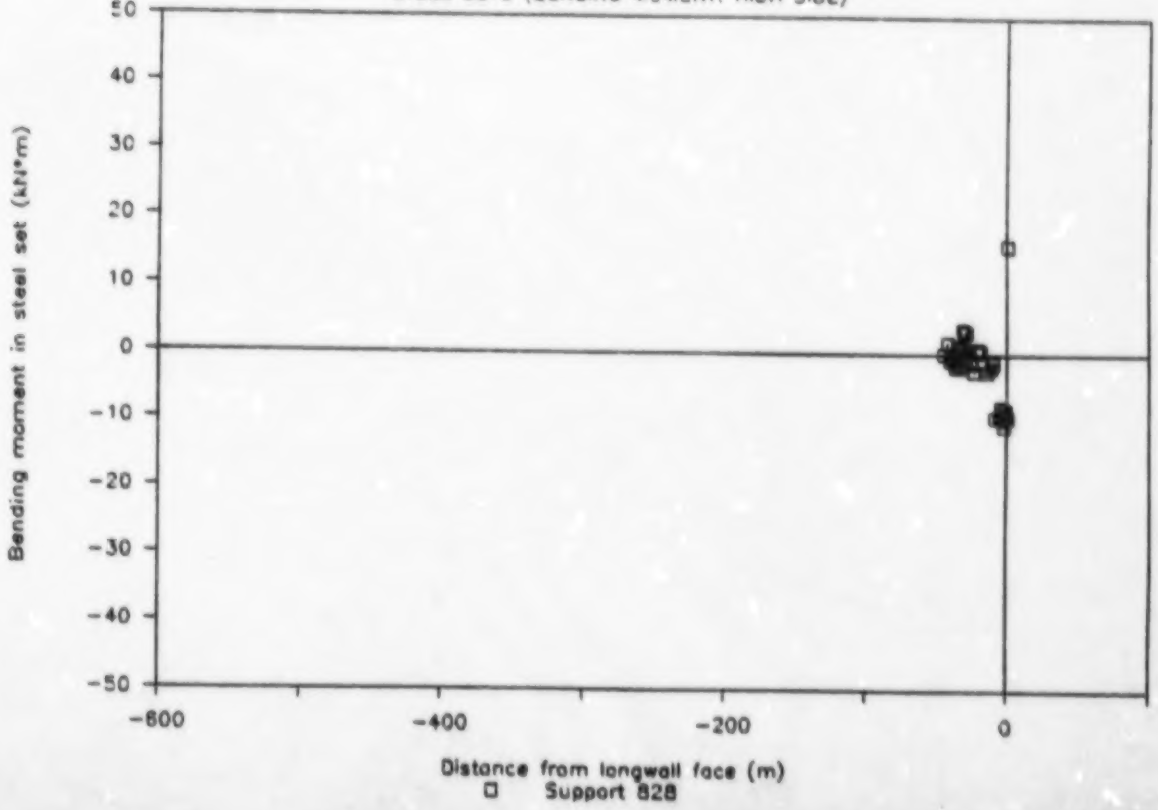
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)



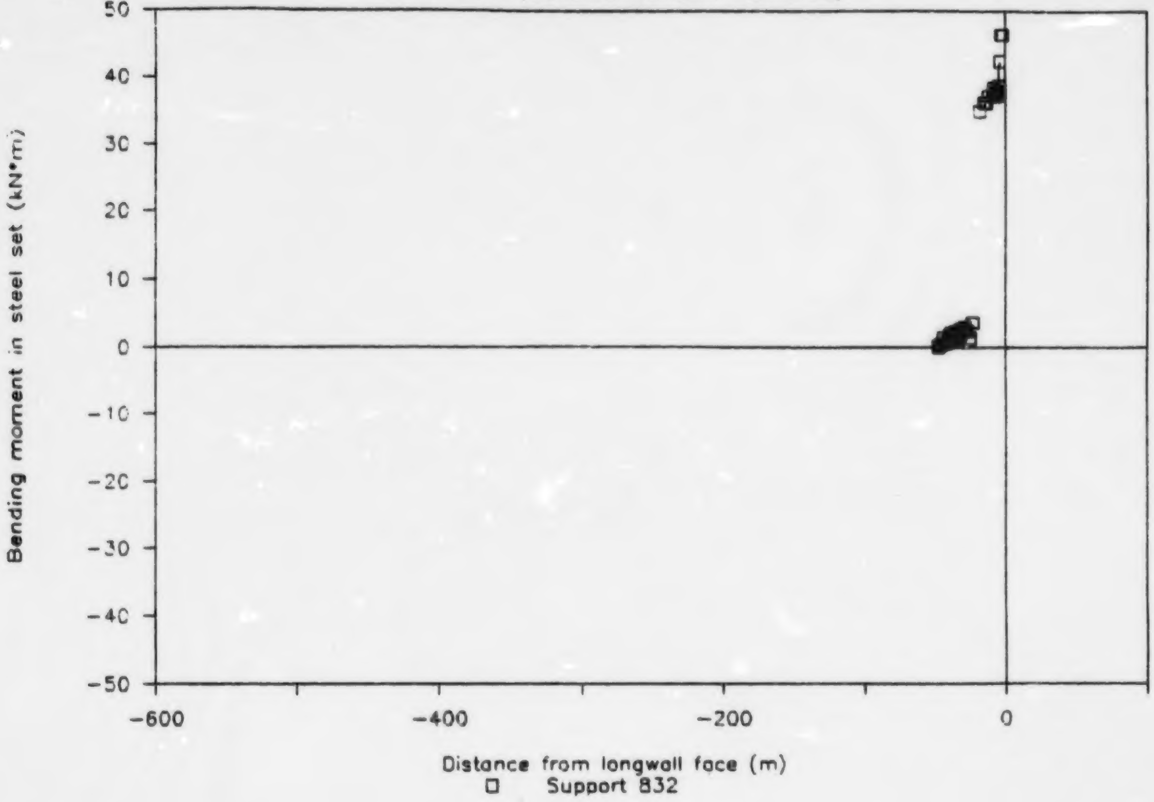
TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)



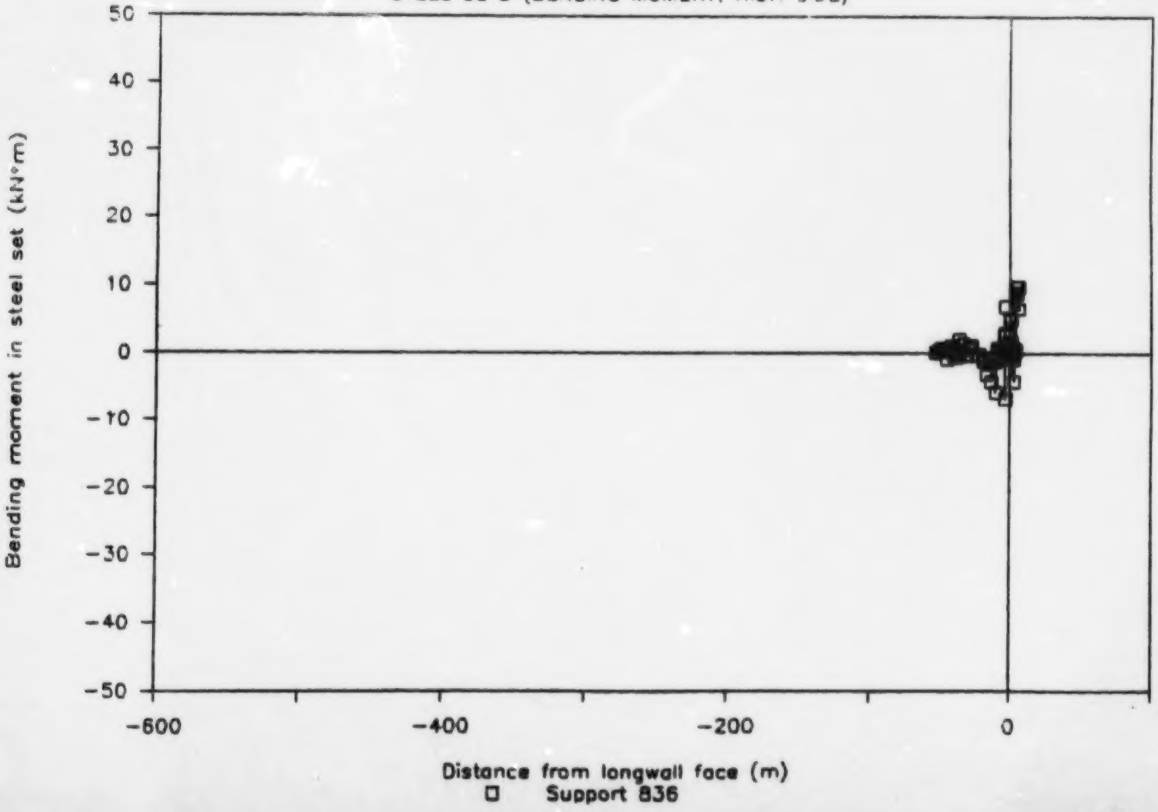
TEST SITE NO.2, PHALEN MINE

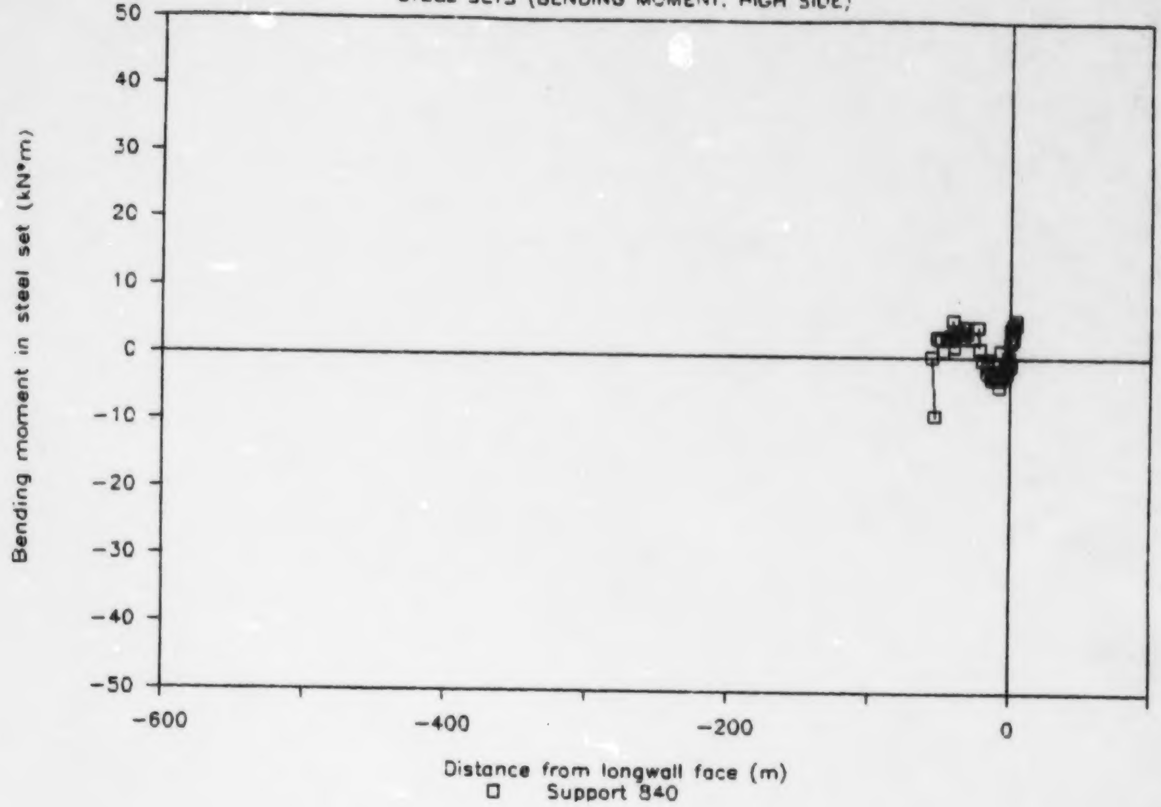
STEEL SETS (BENDING MOMENT, HIGH SIDE)



TEST SITE NO.2, PHALEN MINE

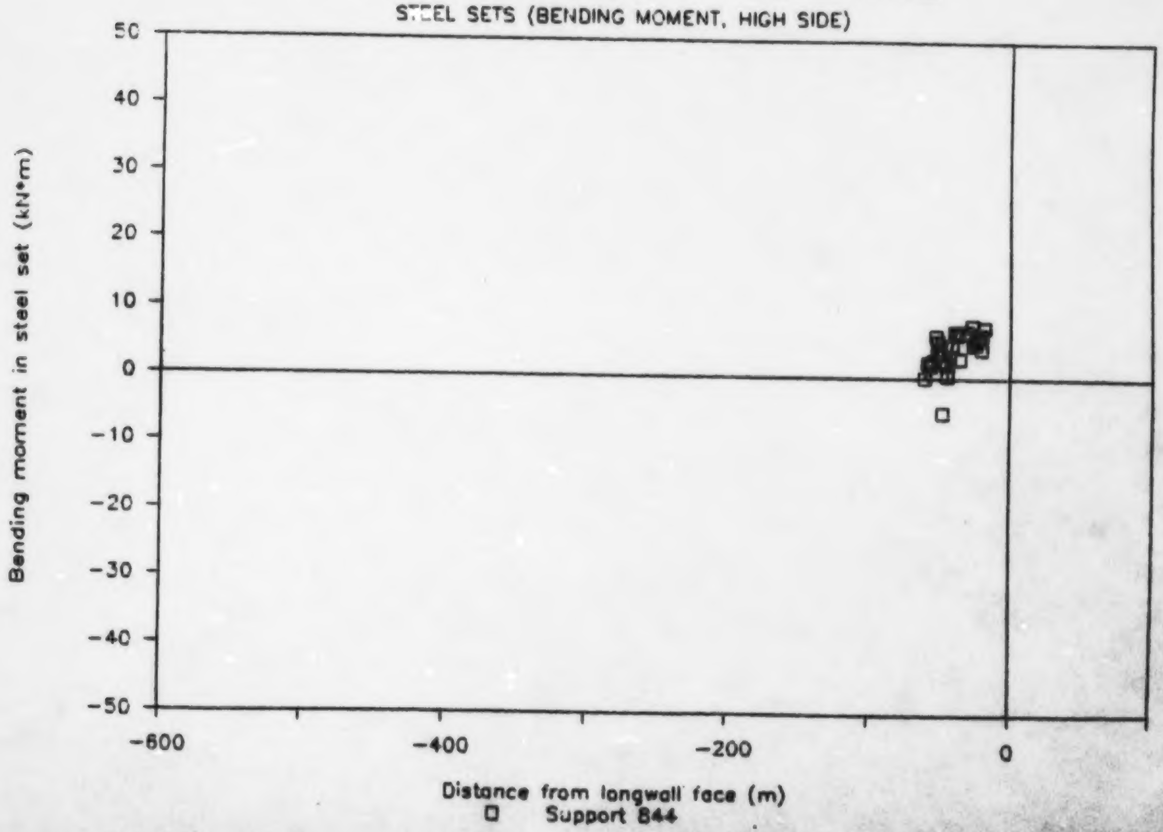
STEEL SETS (BENDING MOMENT, HIGH SIDE)





TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)

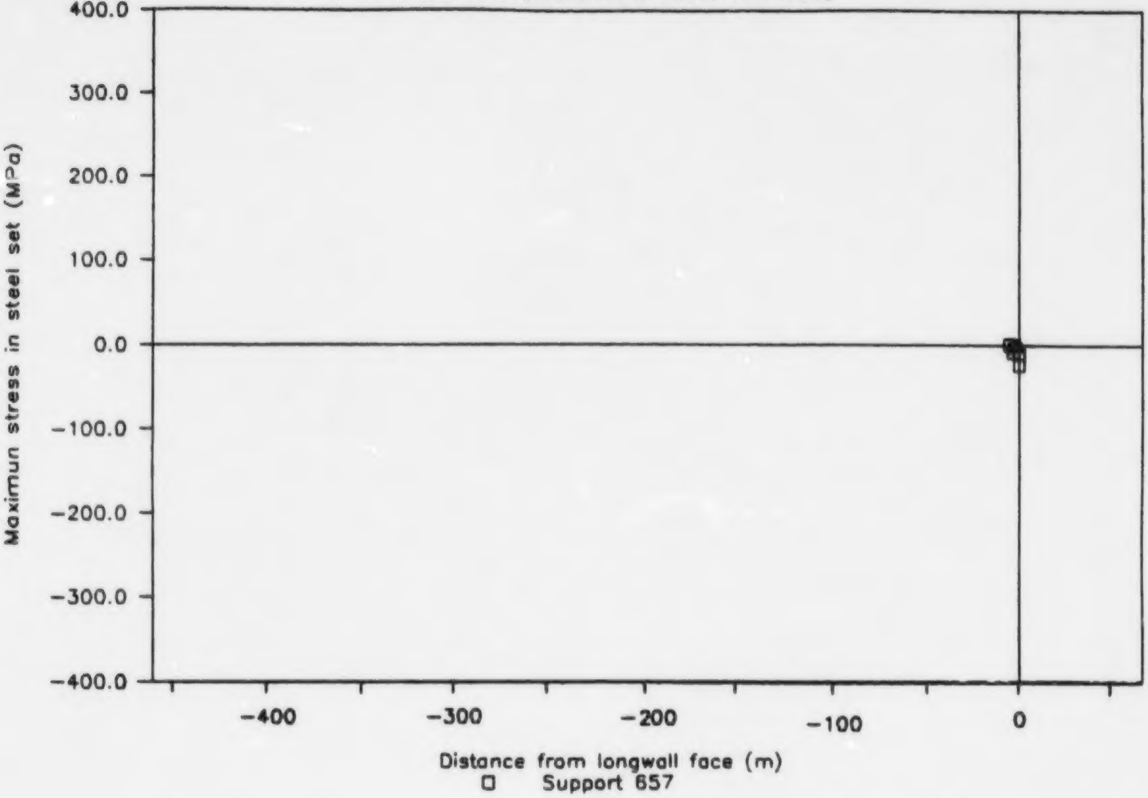


TEST SITE NO.2, PHALEN MINE

STEEL SETS (BENDING MOMENT, HIGH SIDE)

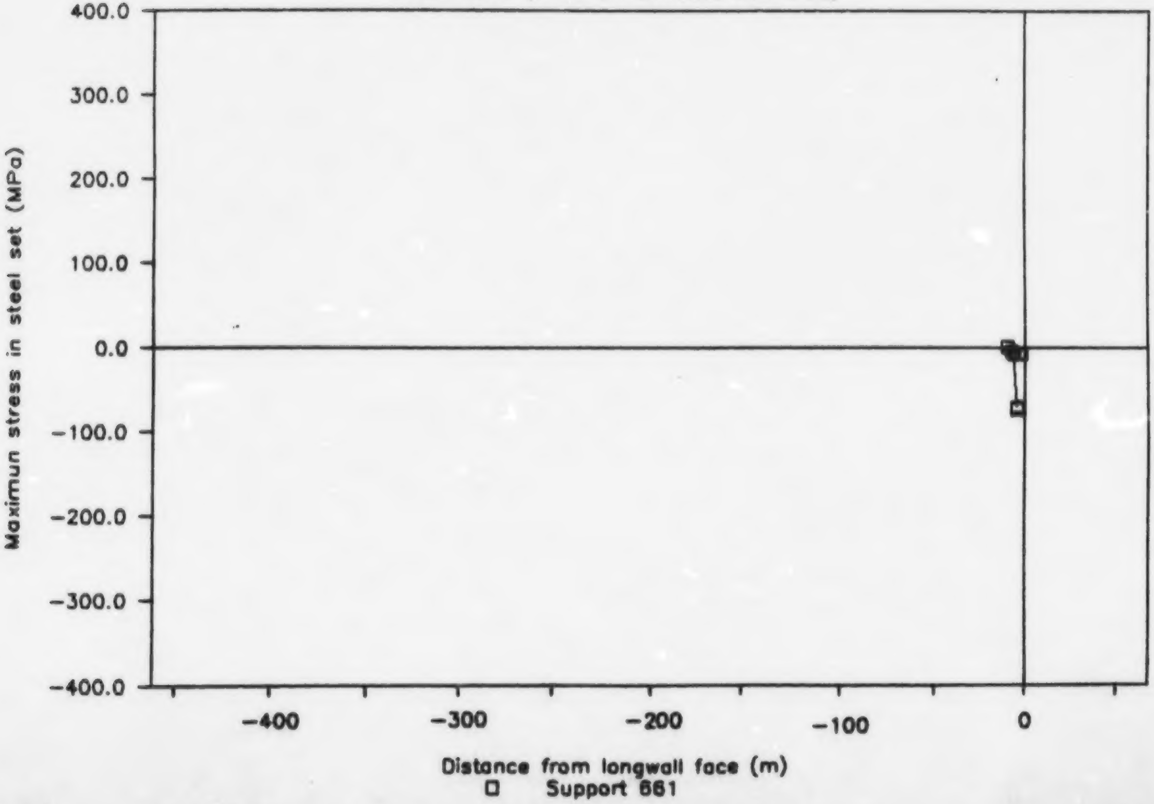
TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, LOW SIDE)



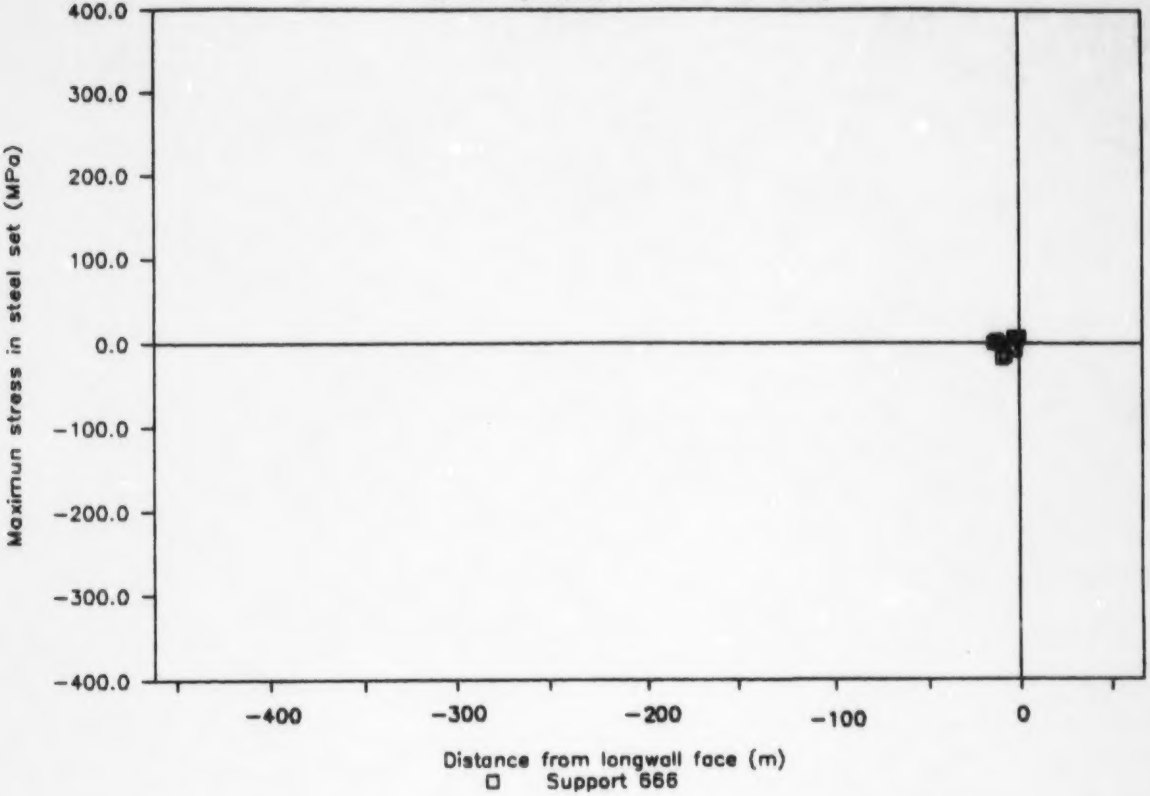
TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, LOW SIDE)



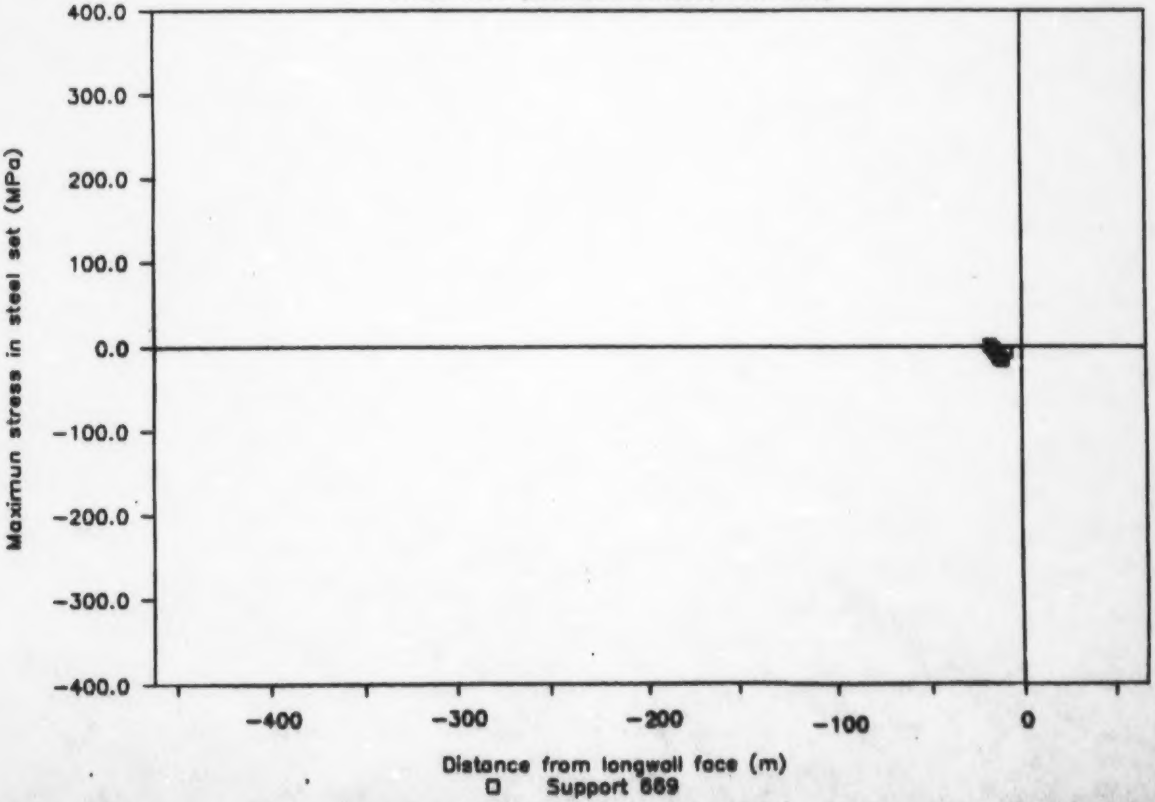
TEST SITE NO.1, PHALEN MINE

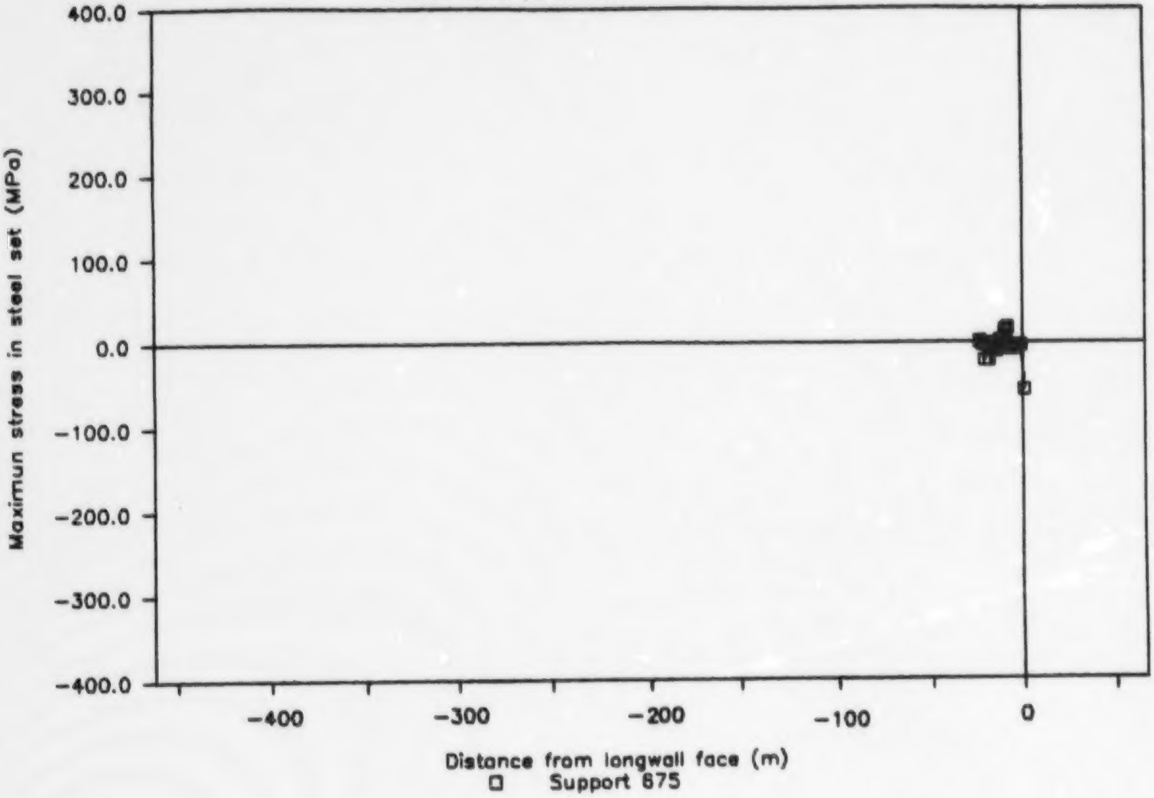
STEEL SETS (MAXIMUN STRESS, LOW SIDE)



TEST SITE NO.1, PHALEN MINE

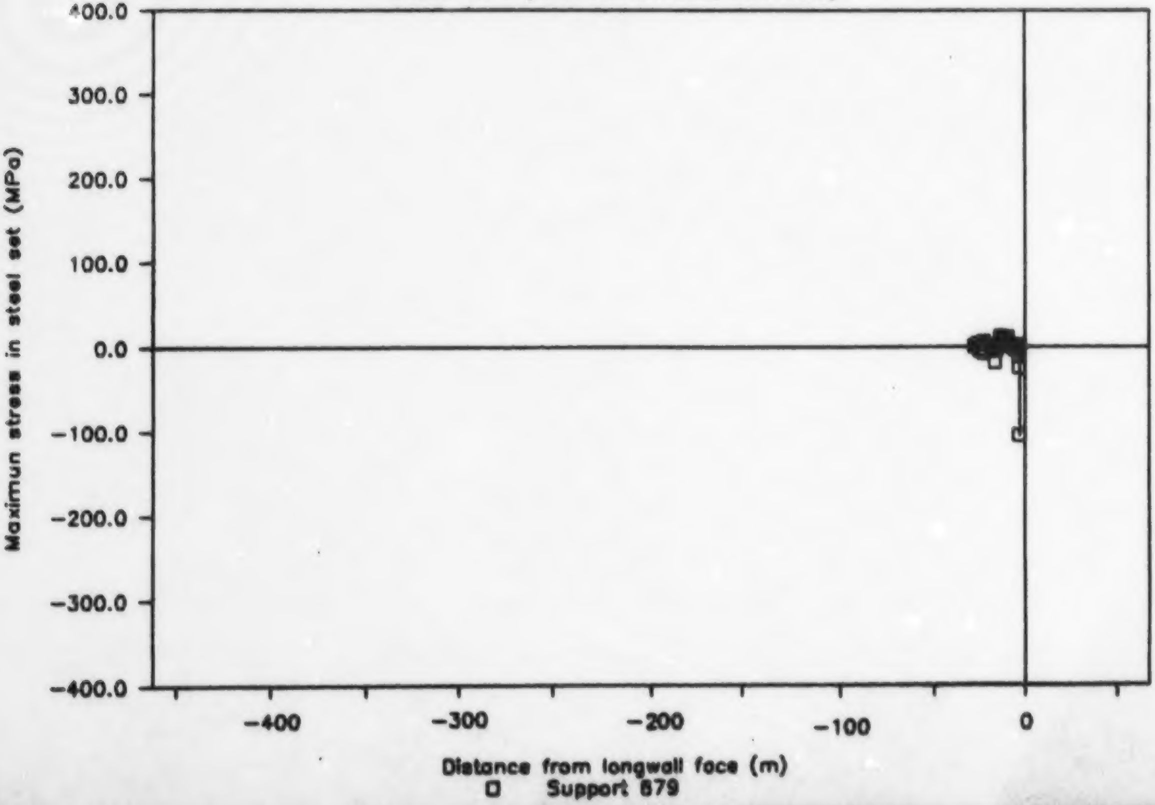
STEEL SETS (MAXIMUN STRESS, LOW SIDE)





TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, LOW SIDE)

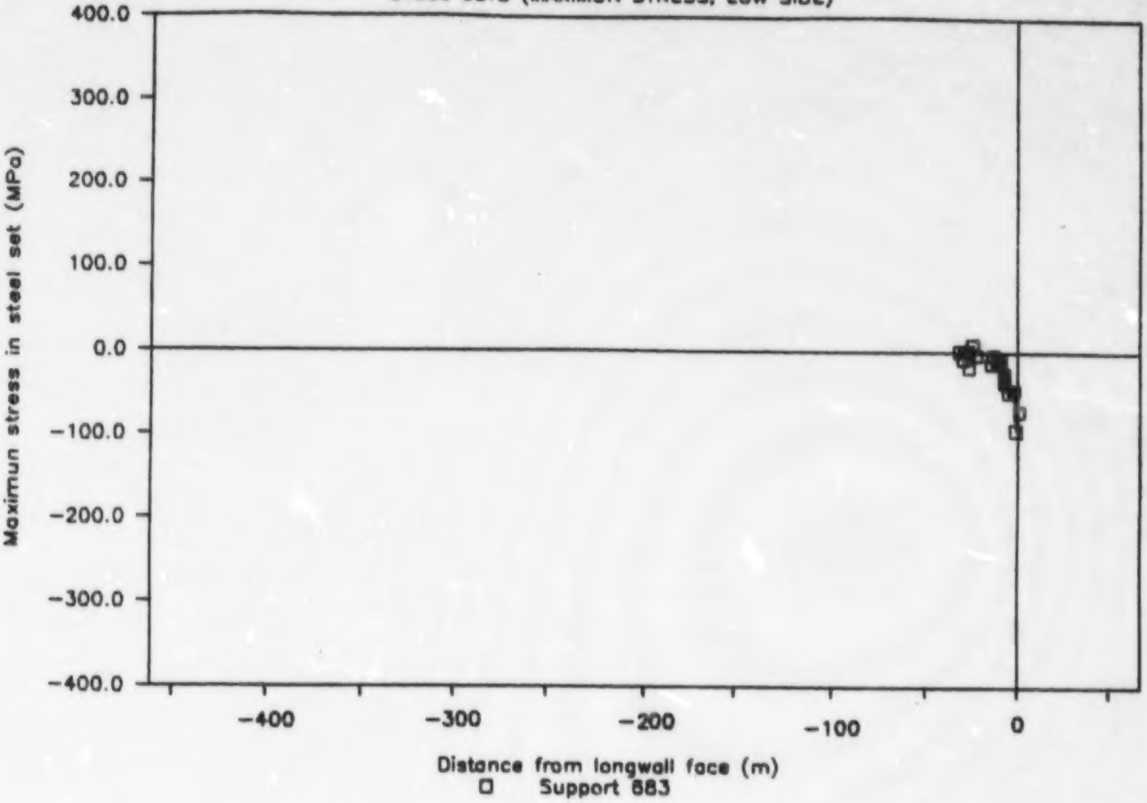


TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, LOW SIDE)

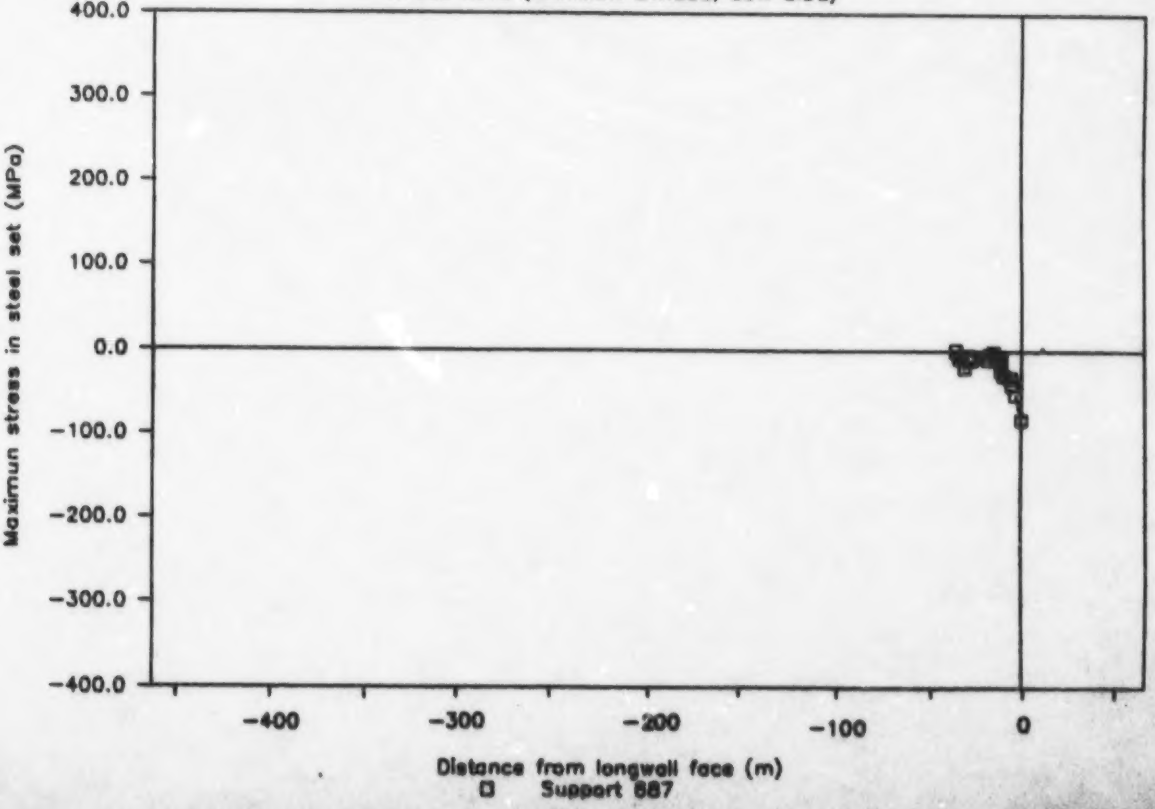
TEST SITE NO.1, PHALEN MINE

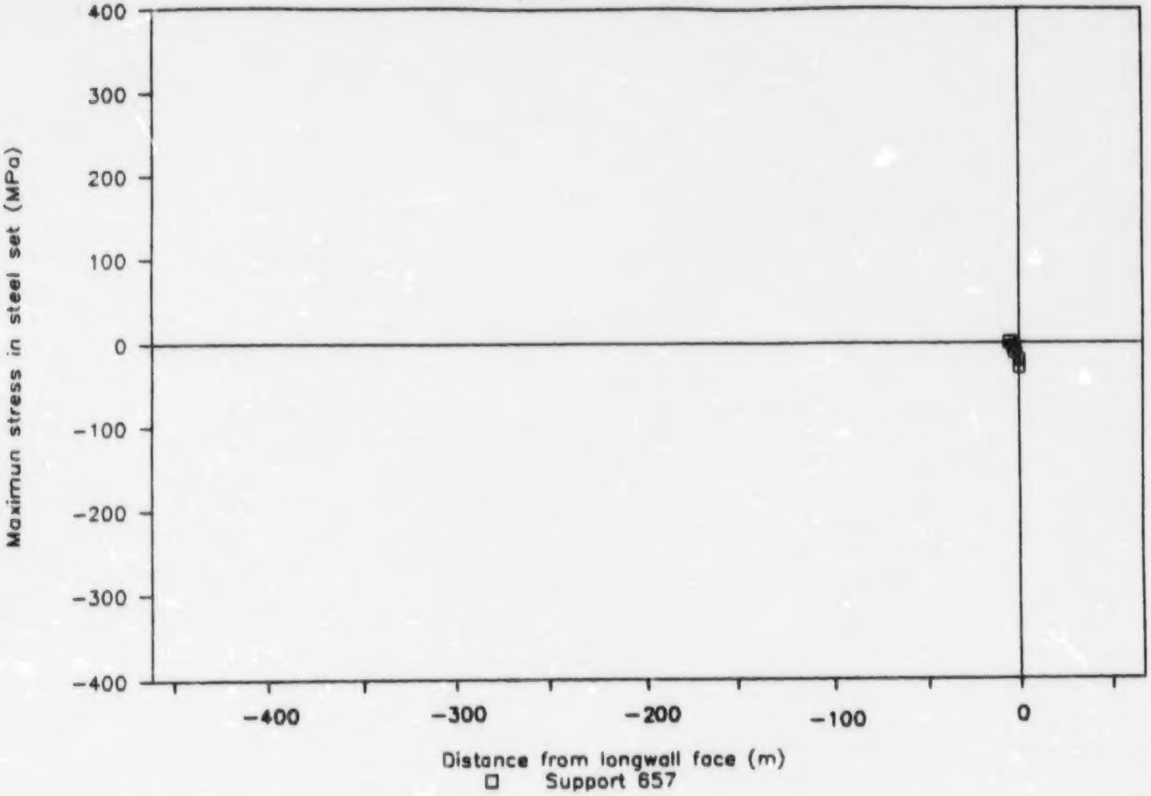
STEEL SETS (MAXIMUN STRESS, LOW SIDE)



TEST SITE NO.1, PHALEN MINE

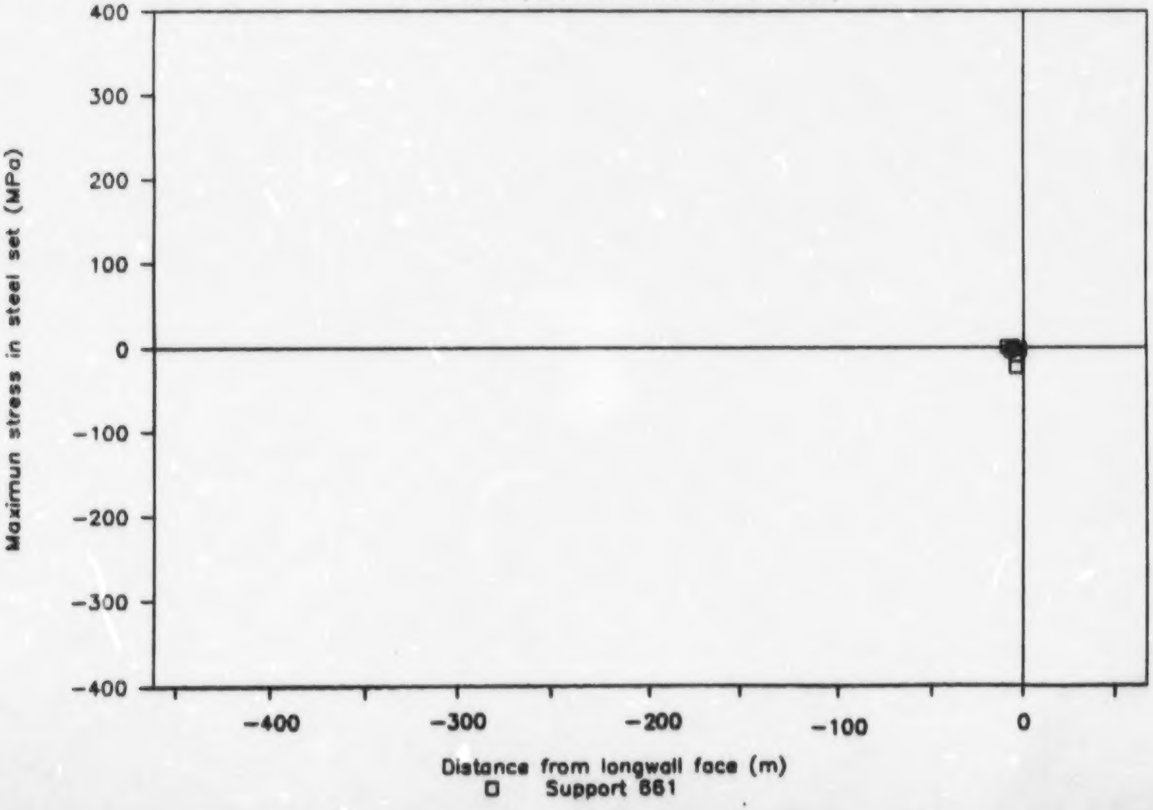
STEEL SETS (MAXIMUN STRESS, LOW SIDE)





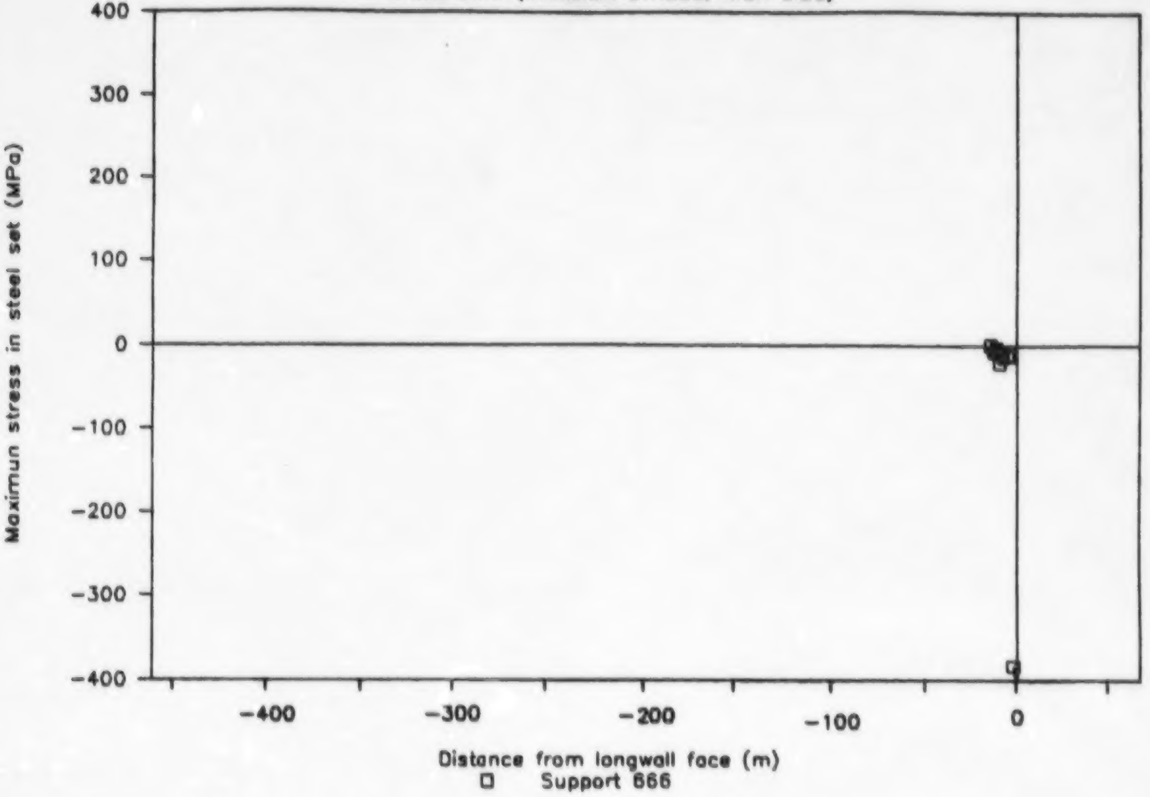
TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, HIGH SIDE)



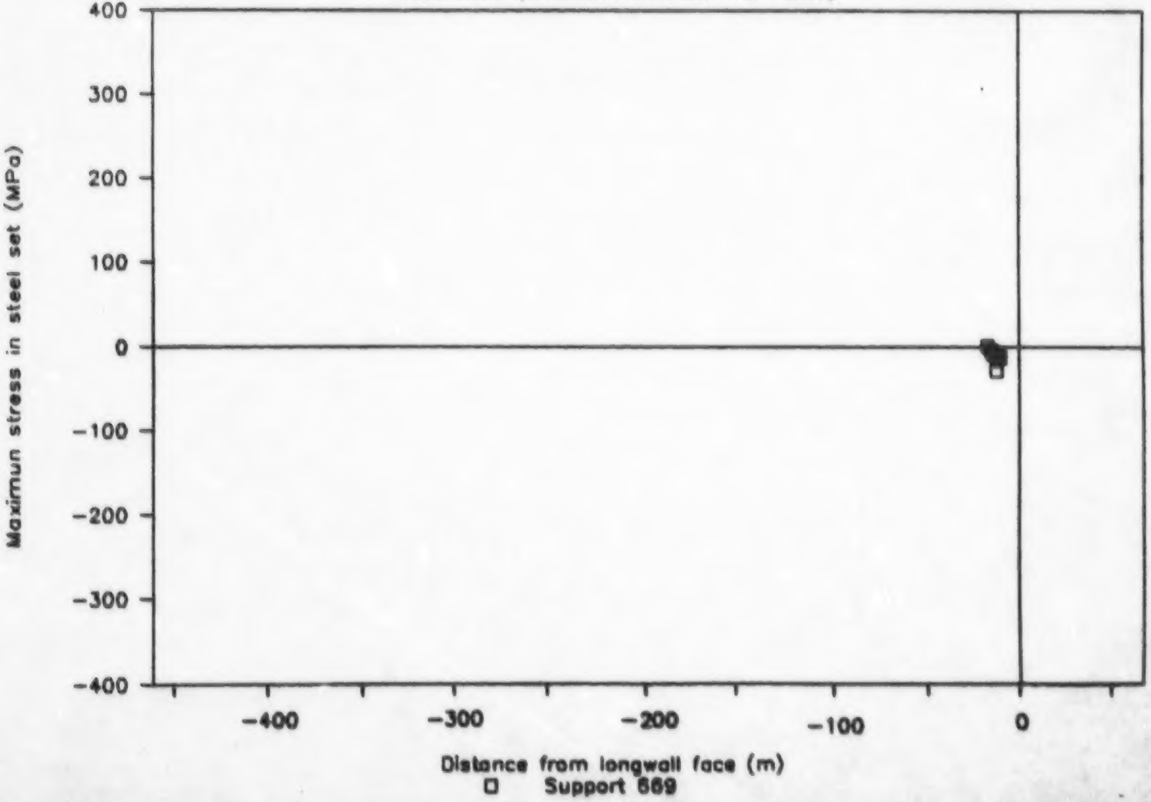
TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, HIGH SIDE)



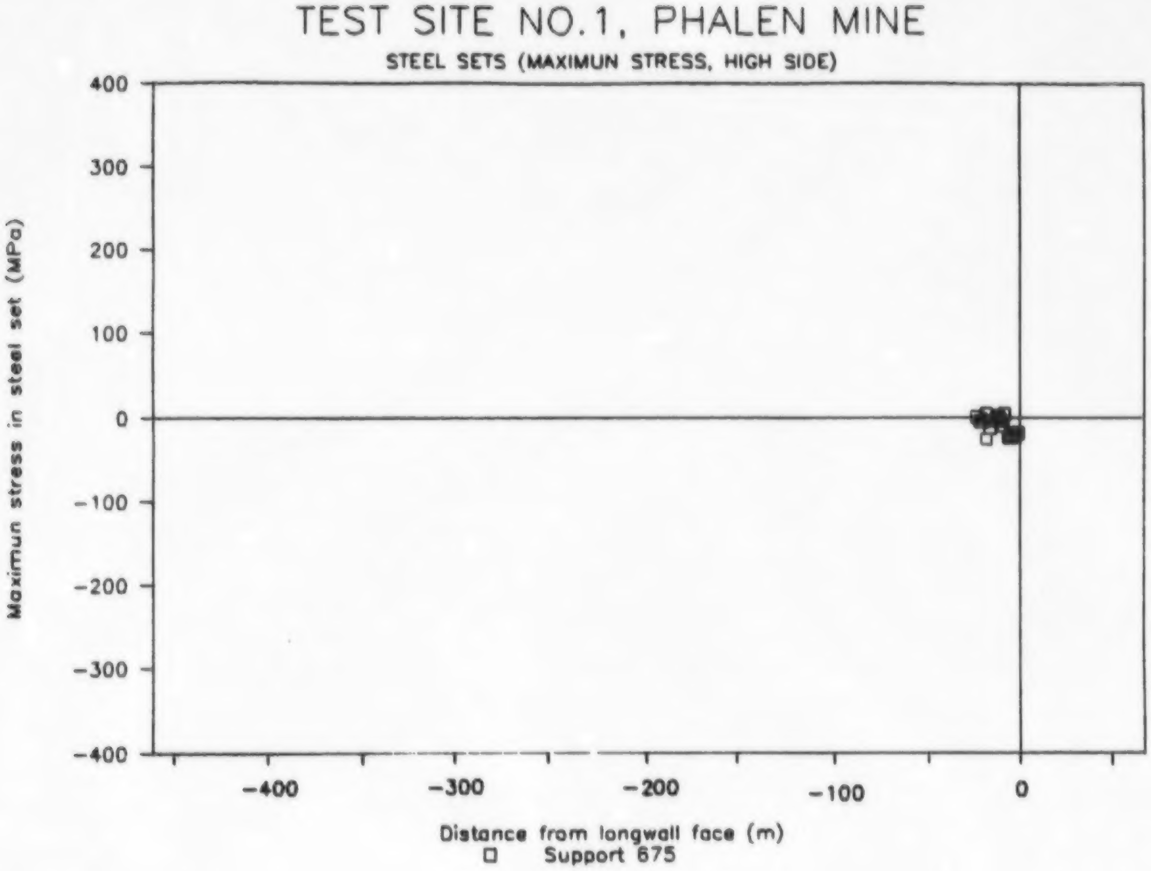
TEST SITE NO.1, PHALEN MINE

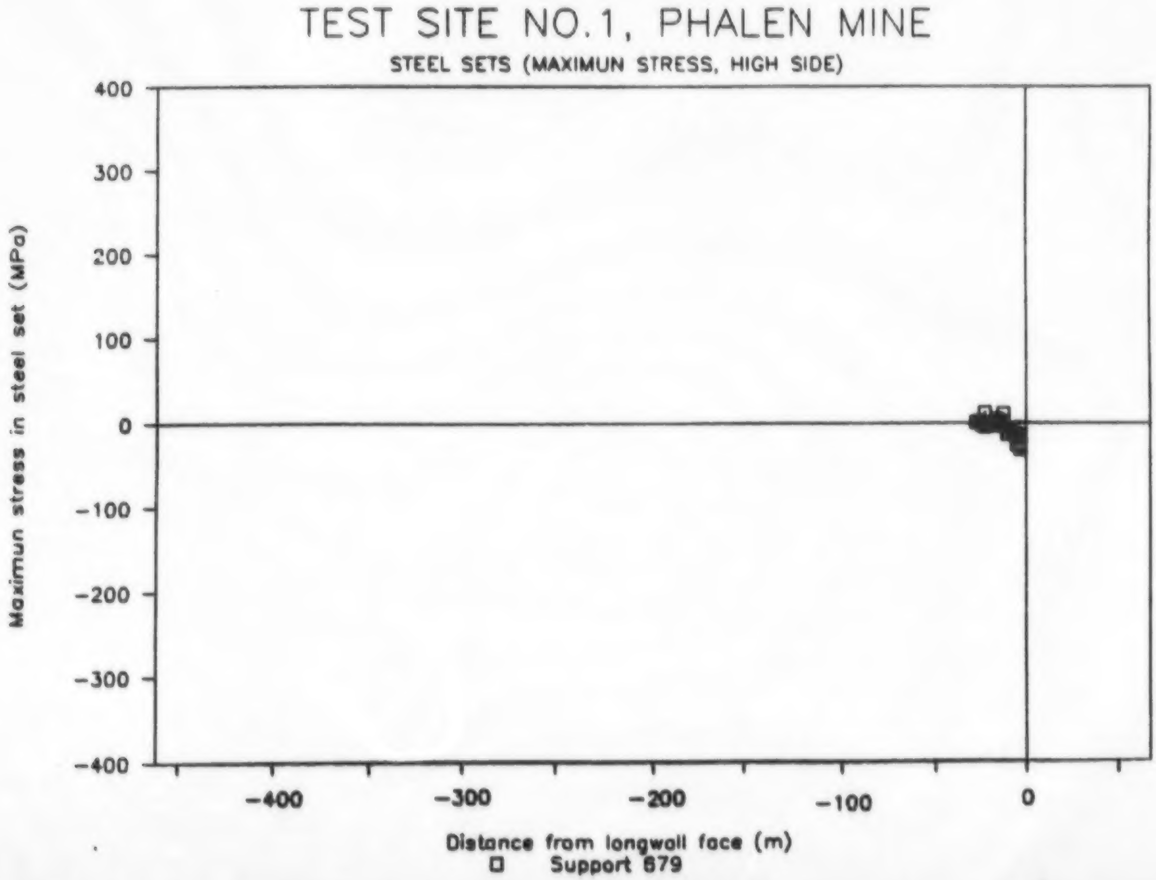
STEEL SETS (MAXIMUN STRESS, HIGH SIDE)

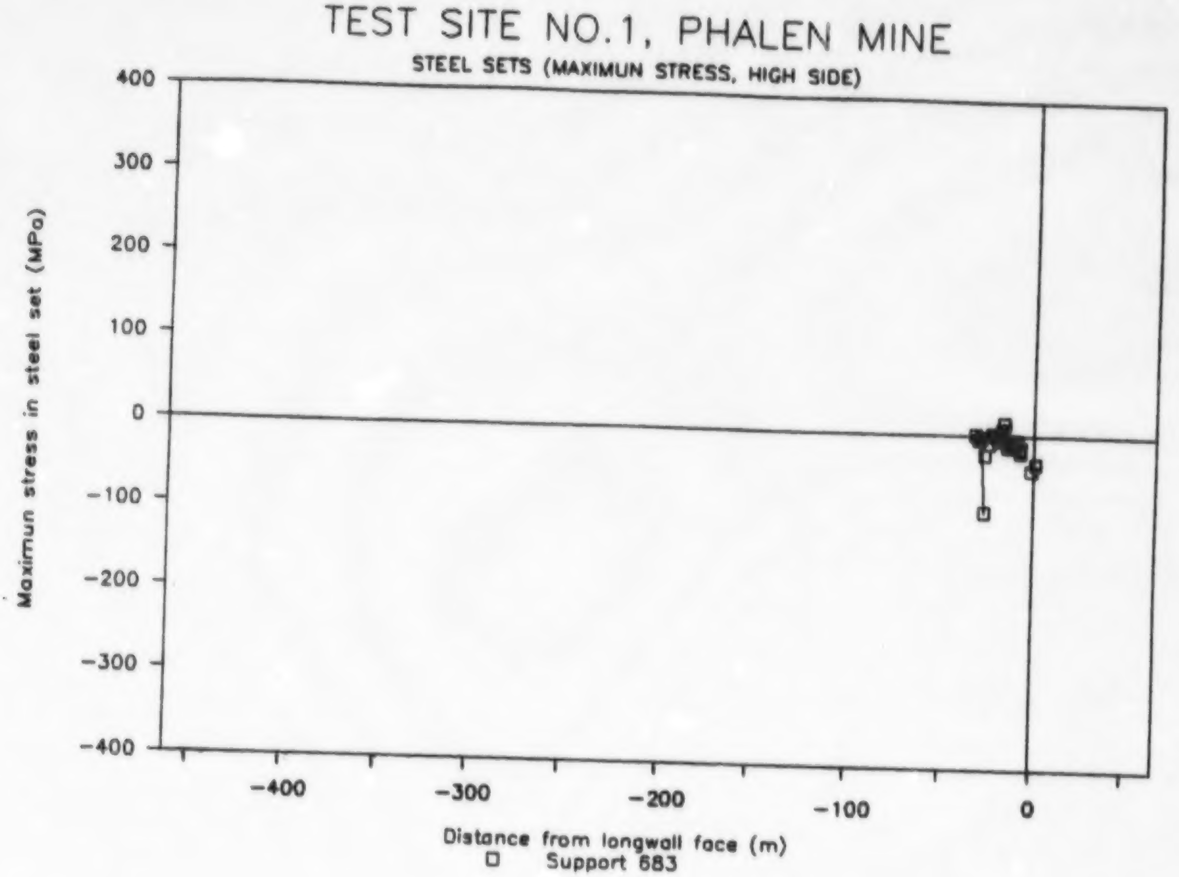


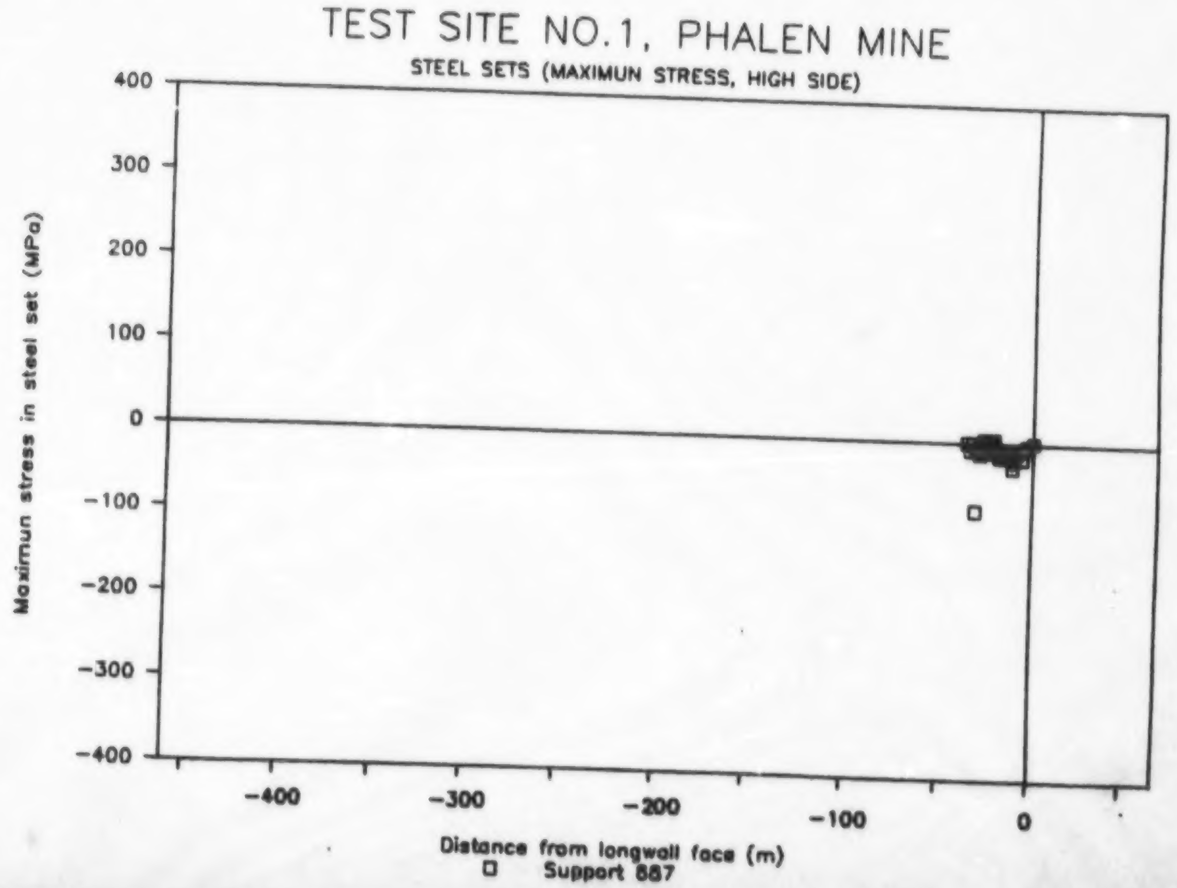
TEST SITE NO.1, PHALEN MINE

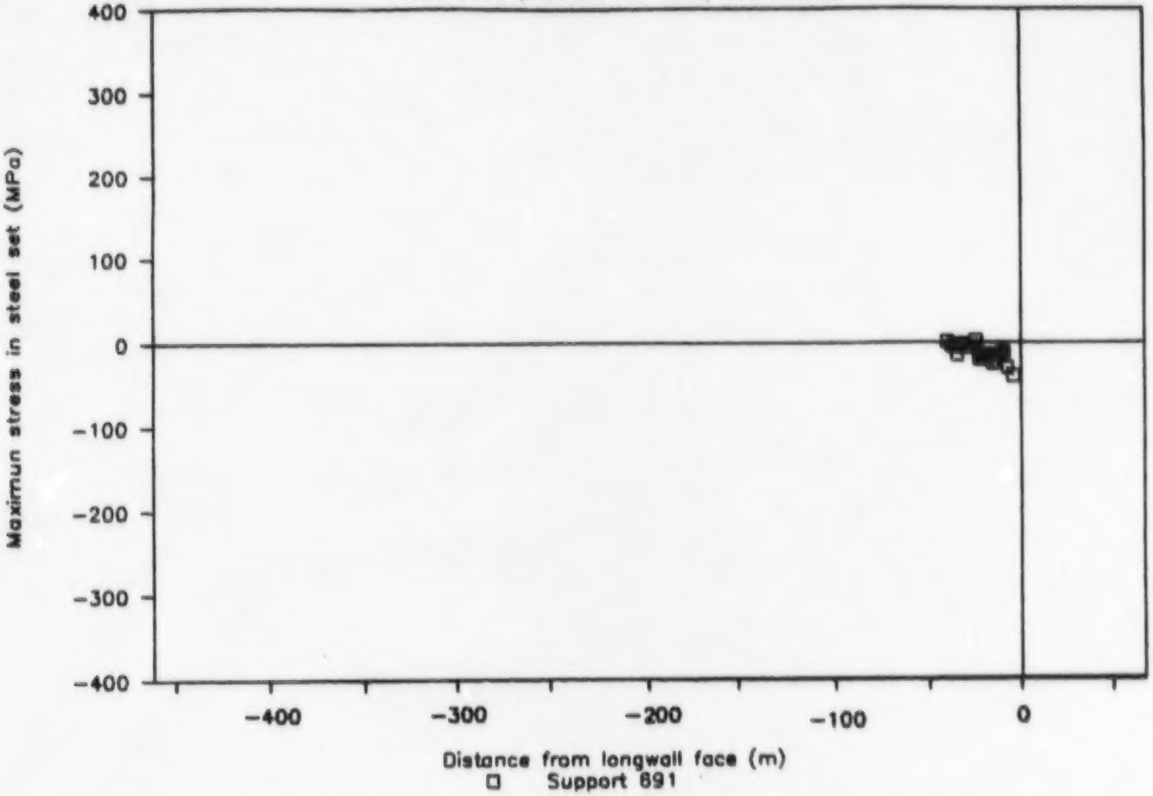
STEEL SETS (MAXIMUN STRESS, HIGH SIDE)


TEST SITE NO.1, PHALEN MINE
STEEL SETS (MAXIMUN STRESS, HIGH SIDE)
400
300
200
100
0
−100
−200
−300
−400
Maximun stress in steel set (MPa)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 675


TEST SITE NO.1, PHALEN MINE
STEEL SETS (MAXIMUN STRESS, HIGH SIDE)
400
300
200
100
0
−100
−200
−300
−400
Maximun stress in steel set (MPa)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 679


TEST SITE NO.1, PHALEN MINE
STEEL SETS (MAXIMUN STRESS, HIGH SIDE)
400
300
200
100
0
−100
−200
−300
−400
Maximun stress in steel set (MPa)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 683


TEST SITE NO.1, PHALEN MINE
STEEL SETS (MAXIMUN STRESS, HIGH SIDE)
400
300
200
100
0
−100
−200
−300
−400
Maximun stress in steel set (MPa)
−400
−300
−200
−100
0
Distance from longwall face (m)
□ Support 887

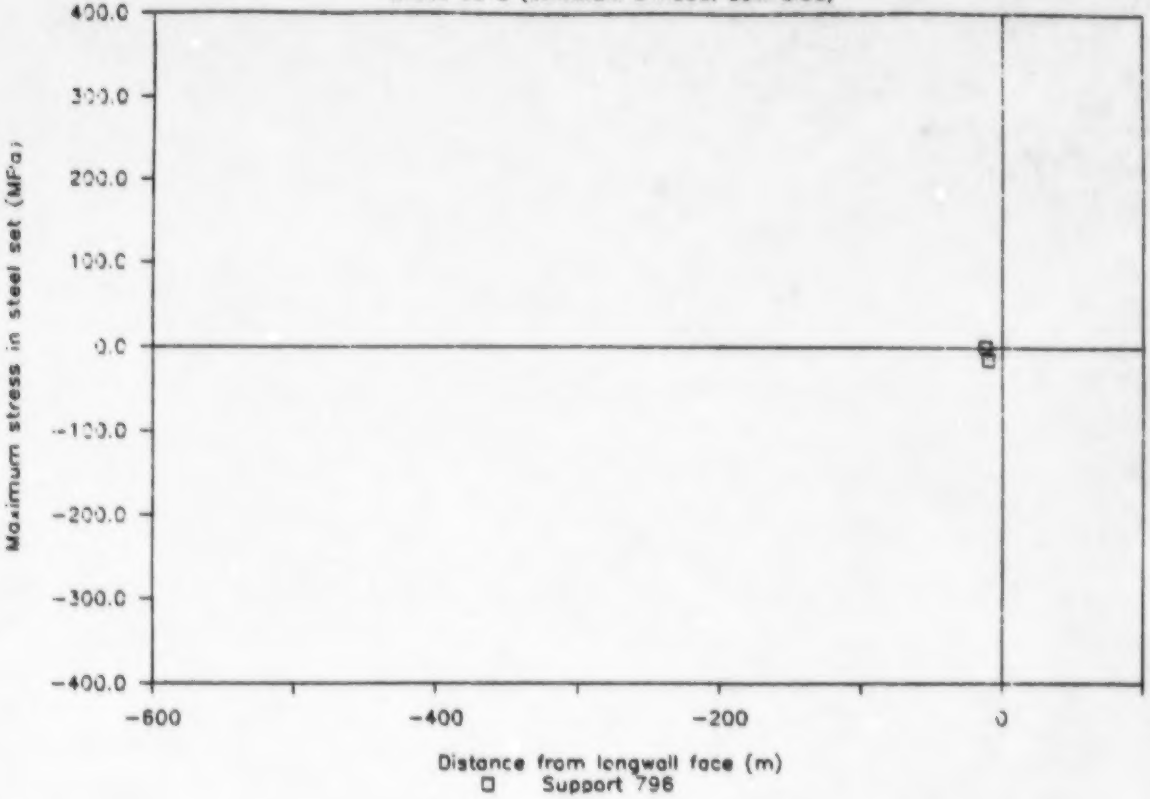


TEST SITE NO.1, PHALEN MINE

STEEL SETS (MAXIMUN STRESS, HIGH SIDE)

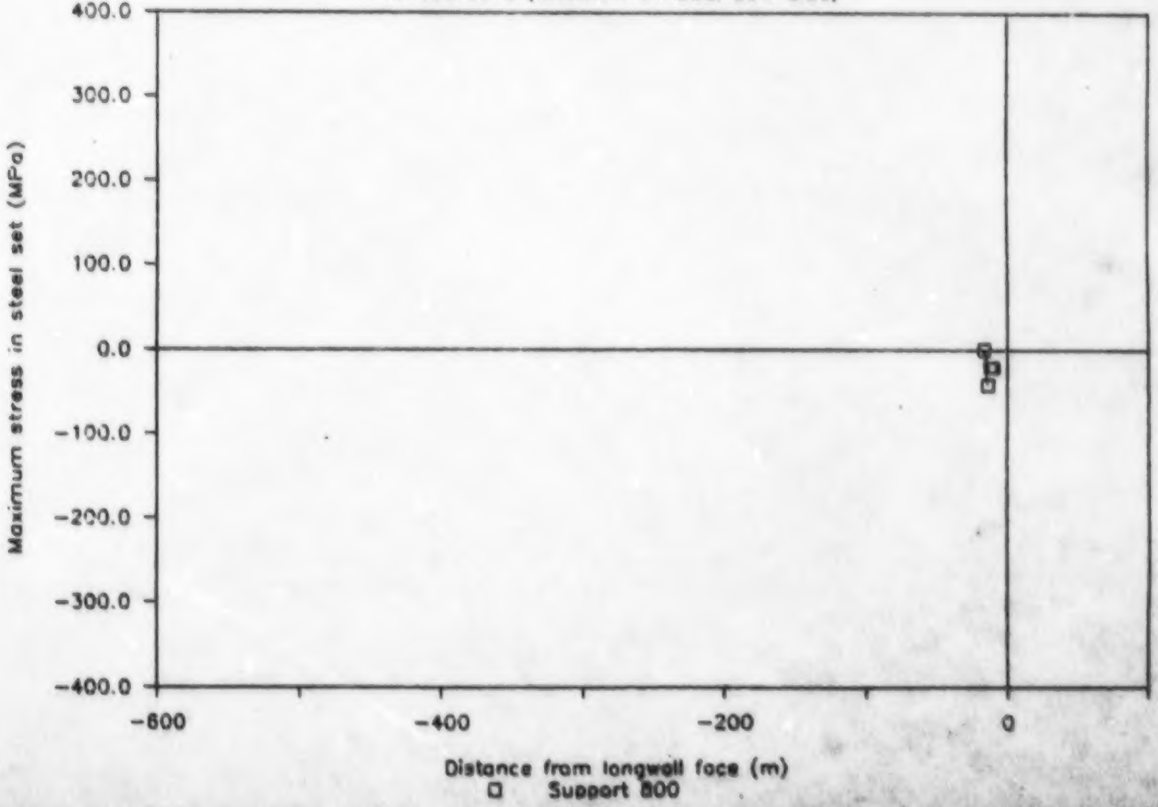
TEST SITE NO.2, PHALEN MINE

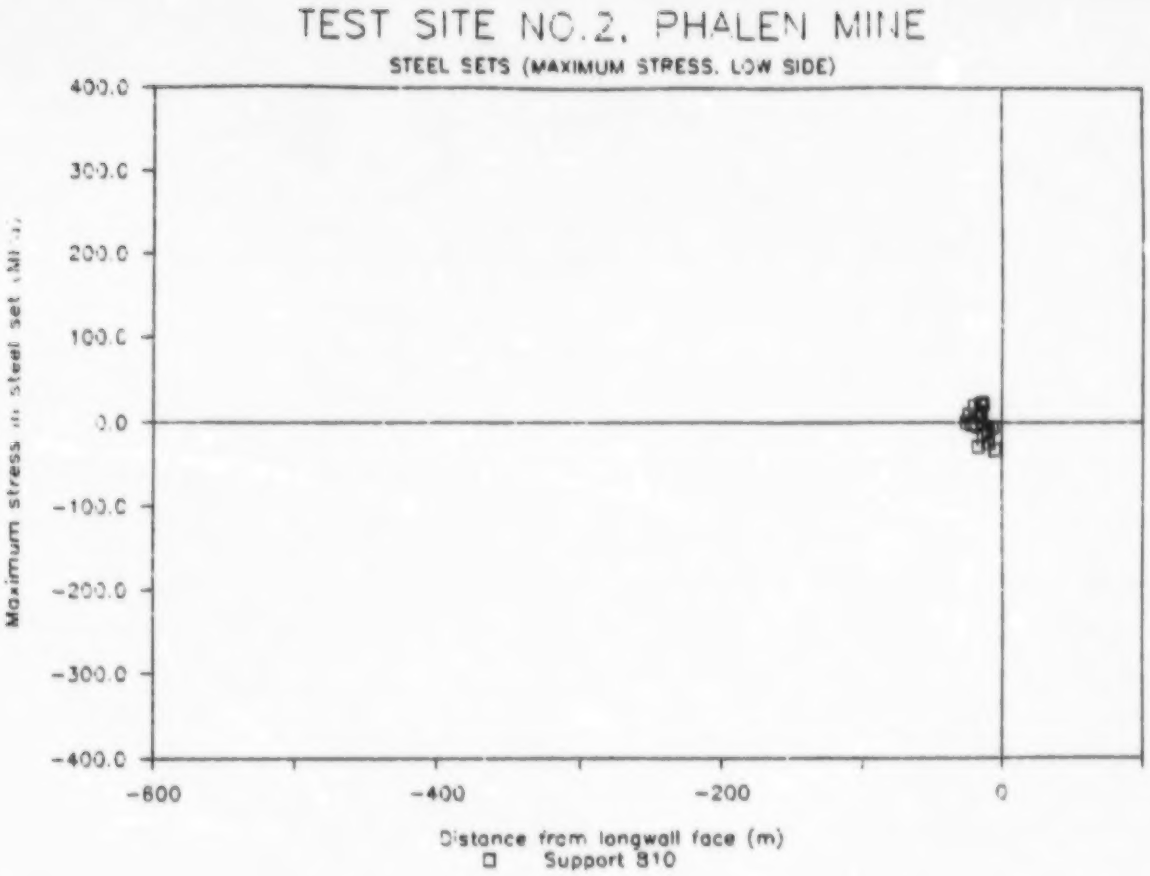
STEEL SETS (MAXIMUM STRESS, LOW SIDE)

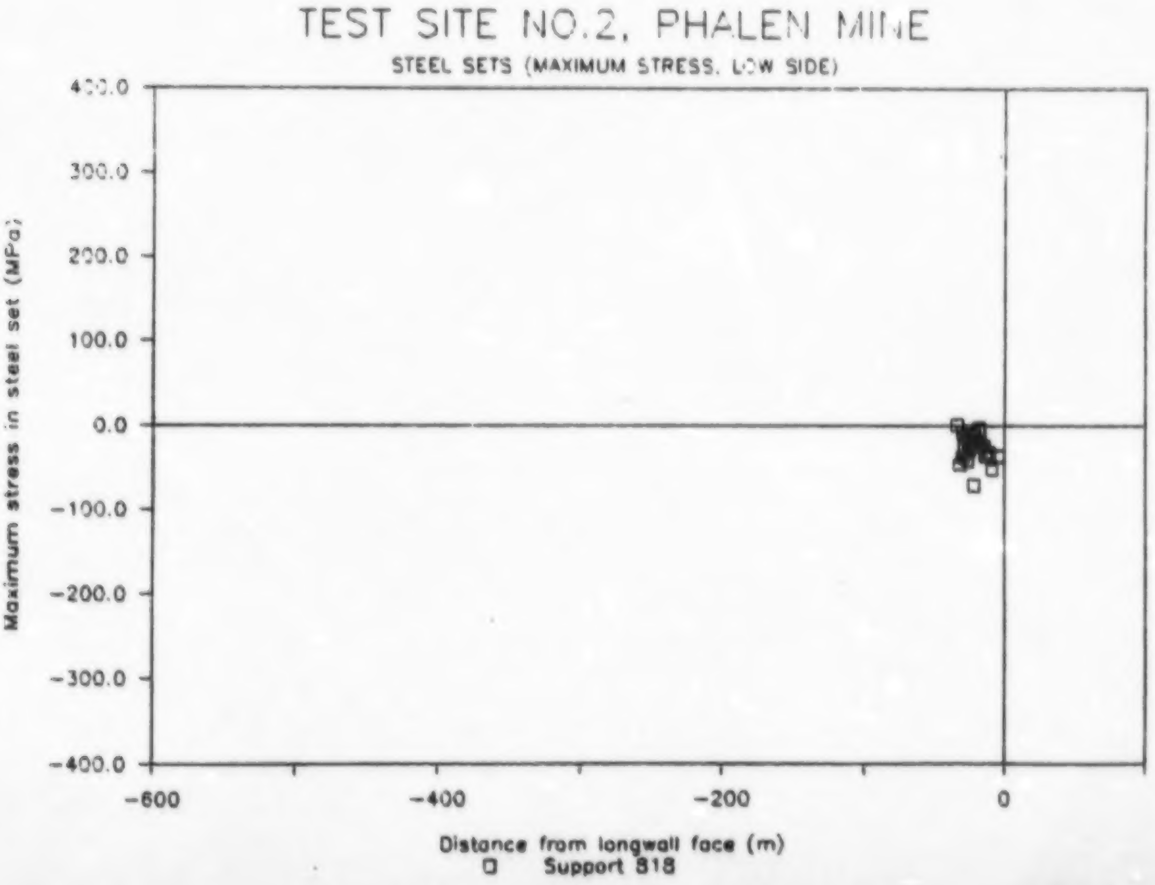


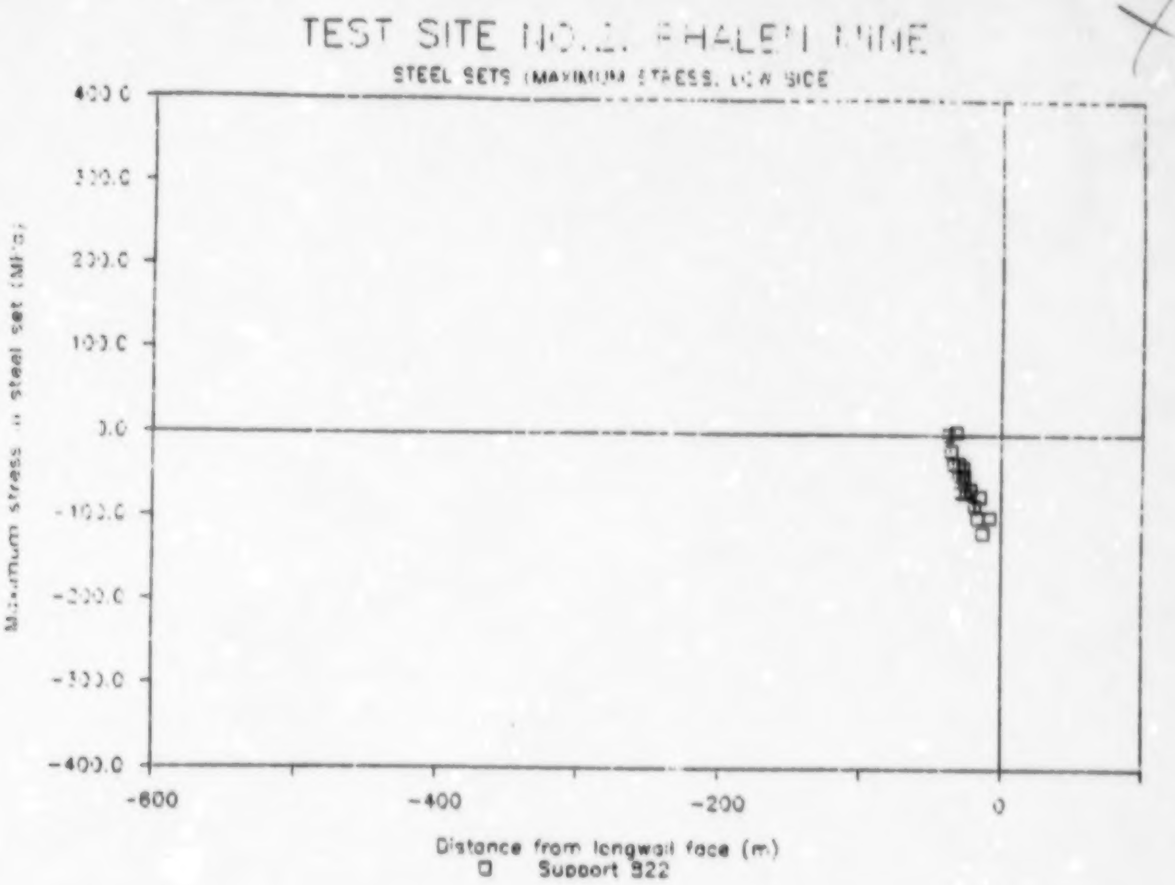
TEST SITE NO.2, PHALEN MINE

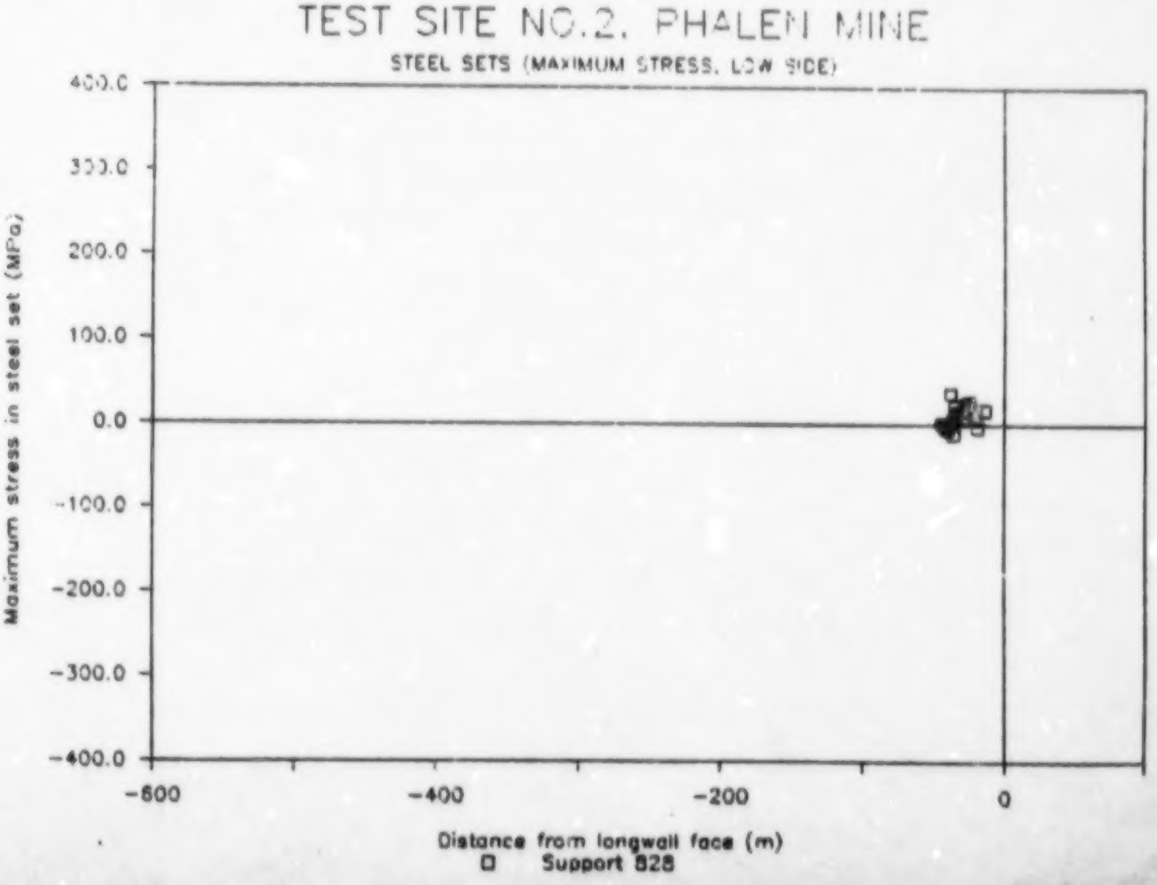
STEEL SETS (MAXIMUM STRESS, LOW SIDE)

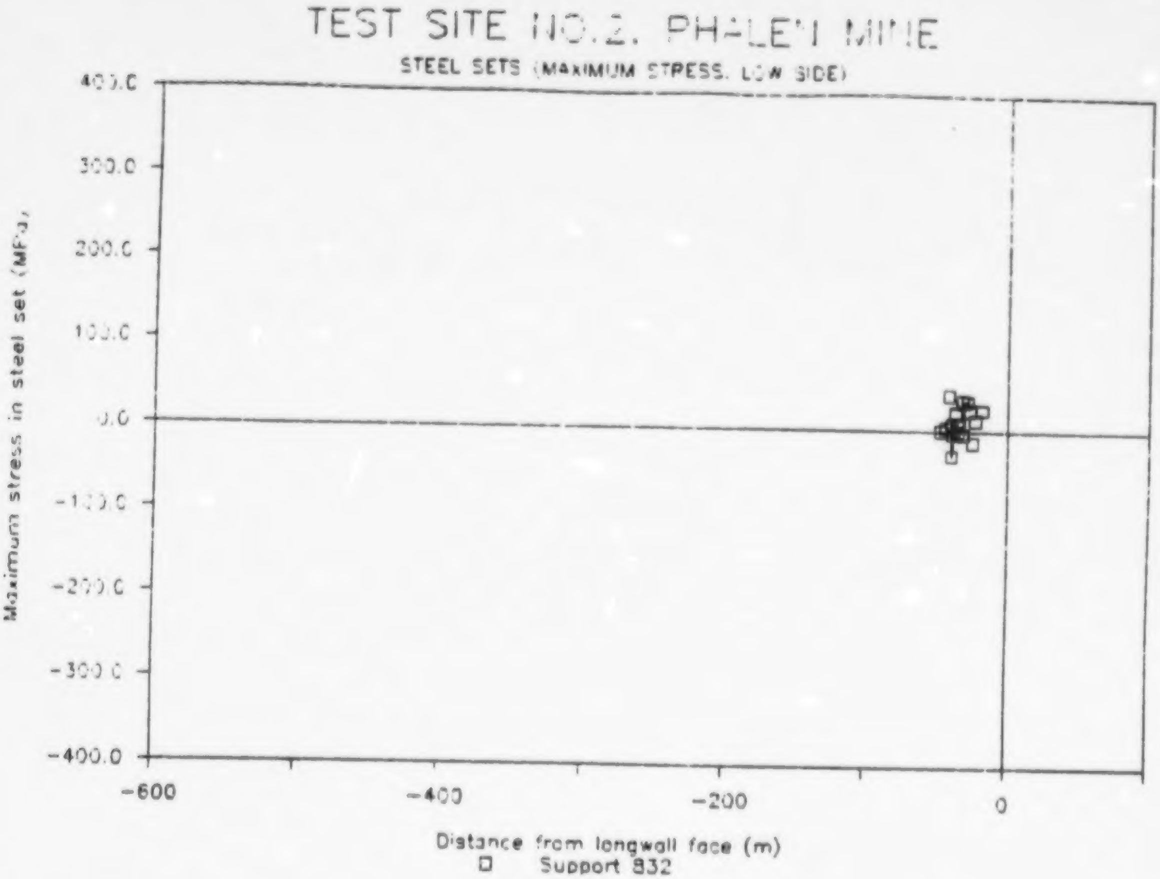


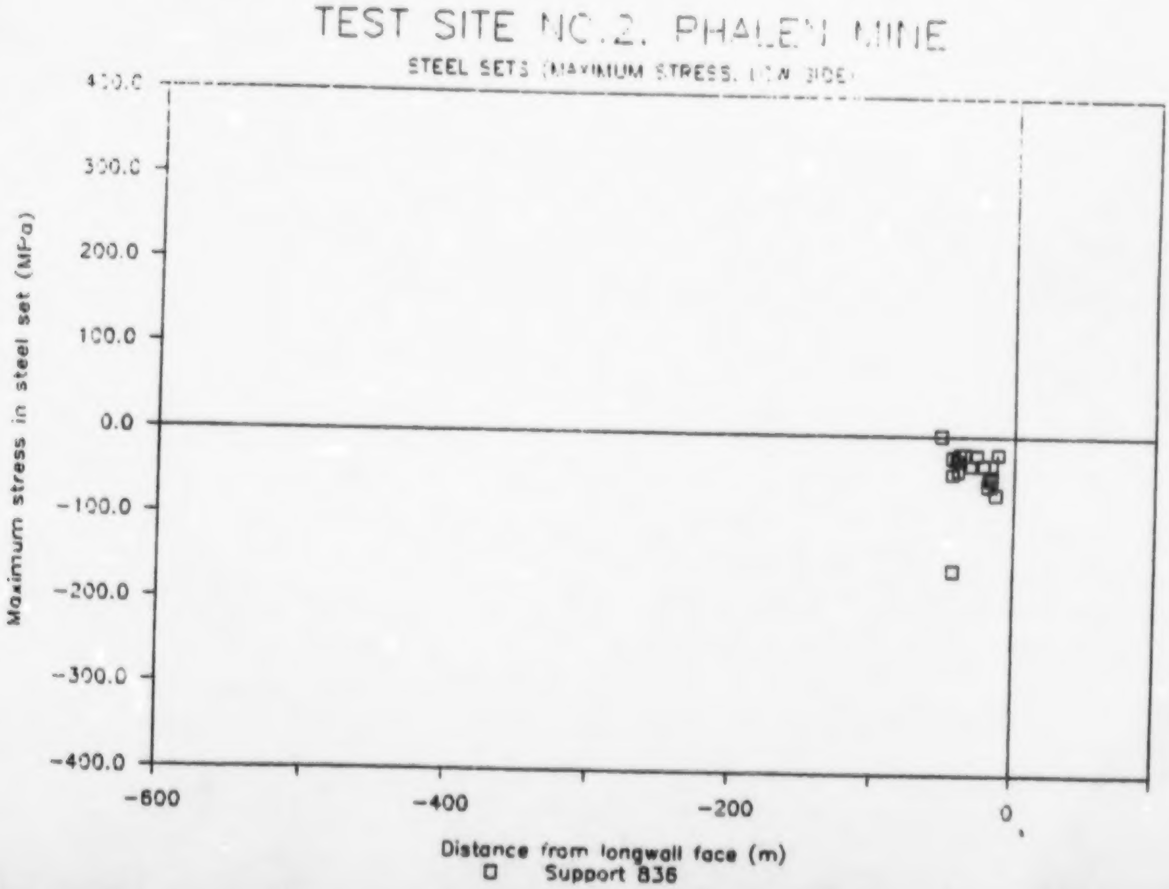

TEST SITE NO.2, PHALEN MINE
STEEL SETS (MAXIMUM STRESS, LOW SIDE)
Maximum stress in steel set (MPa)
400.0
300.0
200.0
100.0
0.0
−100.0
−200.0
−300.0
−400.0
−600
−400
−200
0
Distance from longwall face (m)
□ Support 810


TEST SITE NO.2, PHALEN MINE
STEEL SETS (MAXIMUM STRESS, LOW SIDE)
Maximum stress in steel set (MPa)
400.0
300.0
200.0
100.0
0.0
−100.0
−200.0
−300.0
−400.0
−600
−400
−200
0
Distance from longwall face (m)
□ Support 818


TEST SITE NO.2. PHALEN MINE
STEEL SETS (MAXIMUM STRESS, LOW SIDE)
Maximum stress in steel set (MPa)
400.0
300.0
200.0
100.0
0.0
-100.0
-200.0
-300.0
-400.0
-600
-400
-200
0
Distance from longwall face (m)
□ Support 822

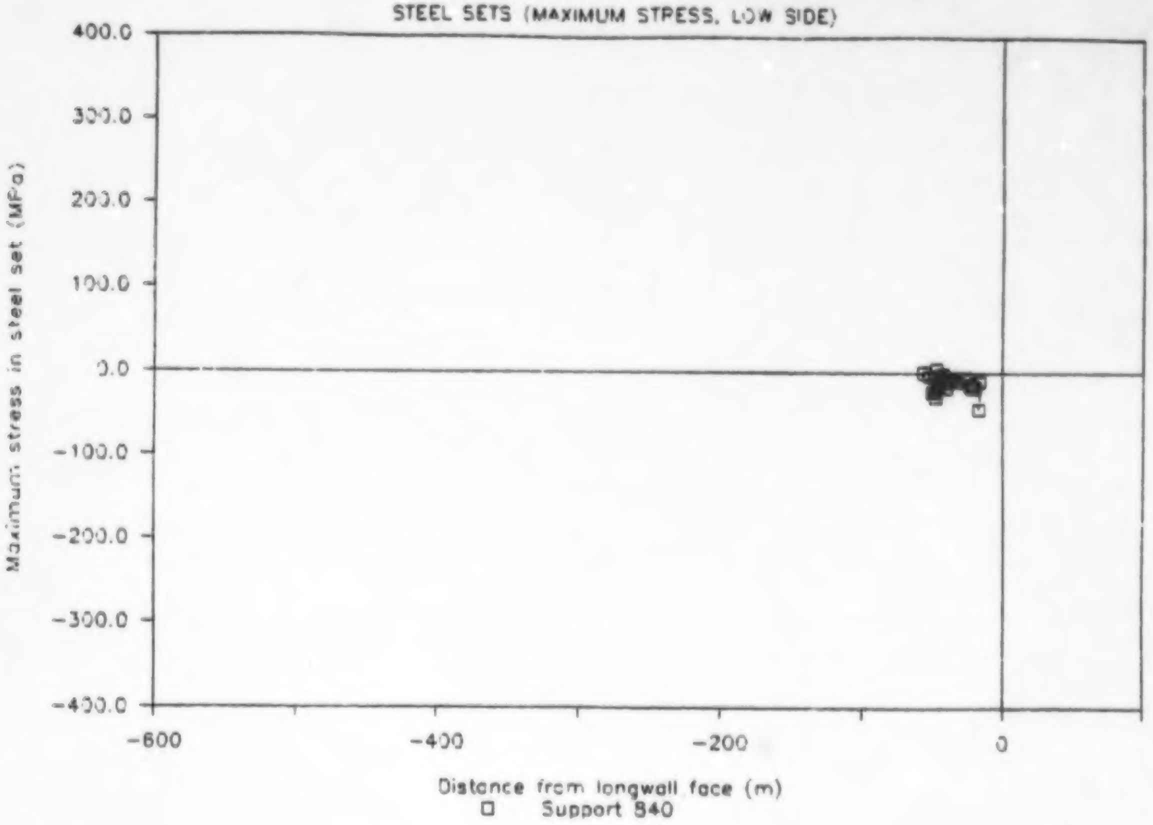

TEST SITE NO.2. PHALEN MINE
STEEL SETS (MAXIMUM STRESS, LOW SIDE)
Maximum stress in steel set (MPa)
400.0
300.0
200.0
100.0
0.0
-100.0
-200.0
-300.0
-400.0
-600
-400
-200
0
Distance from longwall face (m)
□ Support 828


TEST SITE NO.2. PHALEN MINE
STEEL SETS (MAXIMUM STRESS. LOW SIDE)
Maximum stress in steel set (MPa)
400.0
300.0
200.0
100.0
0.0
-100.0
-200.0
-300.0
-400.0
-600
-400
-200
0
Distance from longwall face (m)
□ Support 832


TEST SITE NO.2. PHALEN MINE
STEEL SETS (MAXIMUM STRESS. LOW SIDE)
Maximum stress in steel set (MPa)
400.0
300.0
200.0
100.0
0.0
-100.0
-200.0
-300.0
-400.0
-600
-400
-200
0
Distance from longwall face (m)
□ Support 836

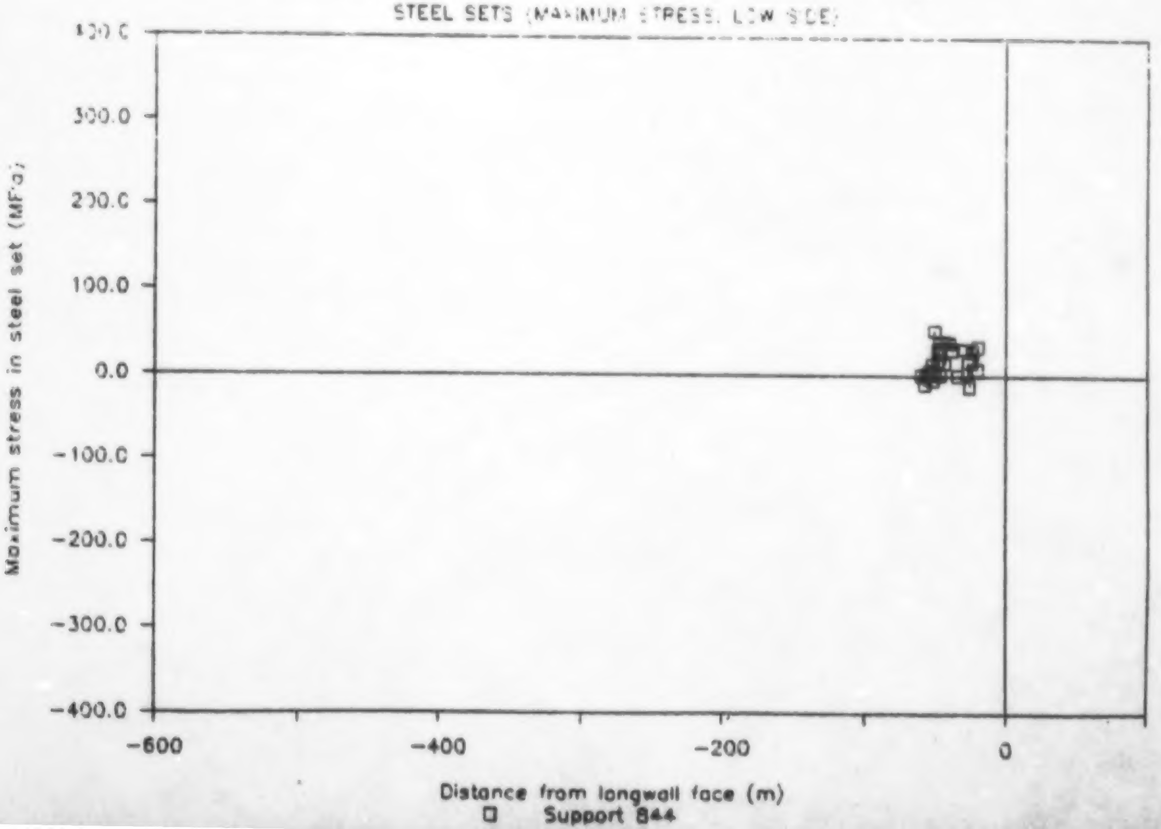
TEST SITE NO.2. PHALEN MINE

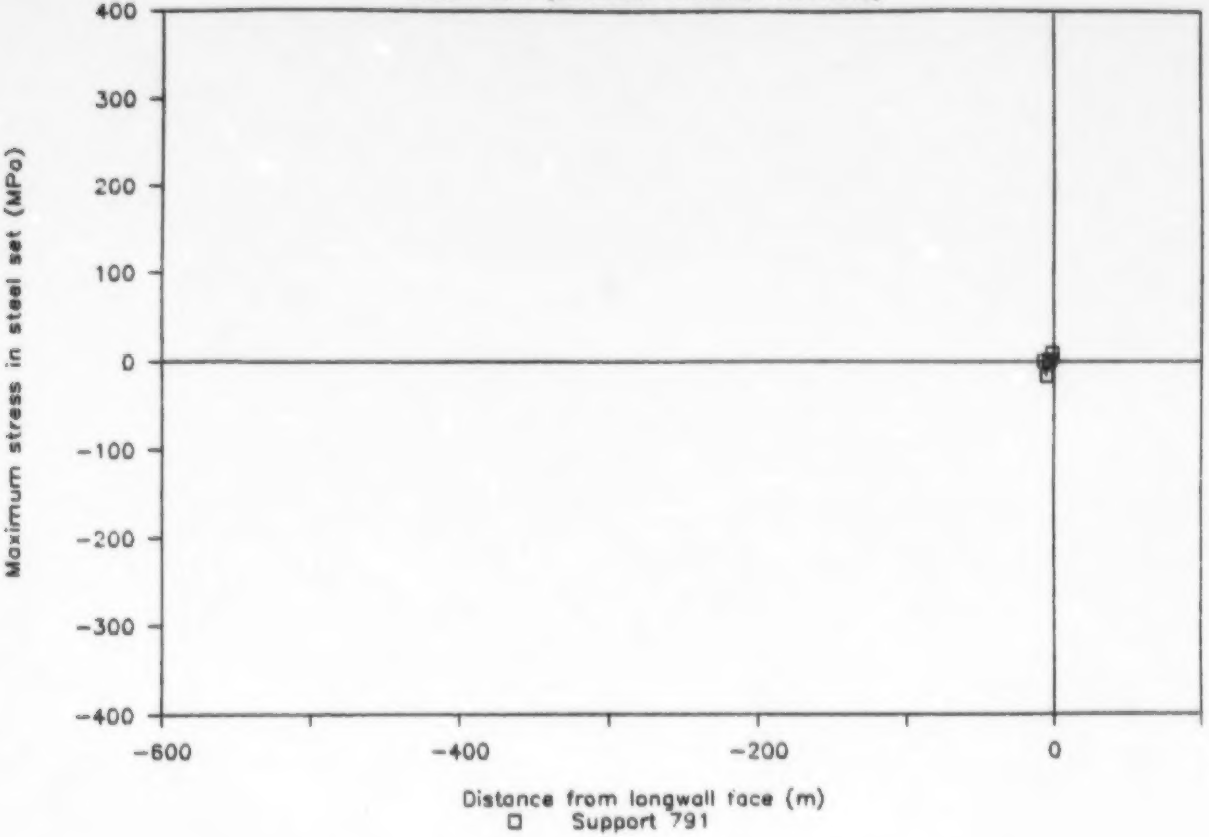
STEEL SETS (MAXIMUM STRESS, LOW SIDE)



TEST SITE NO.2. PHALEN MINE

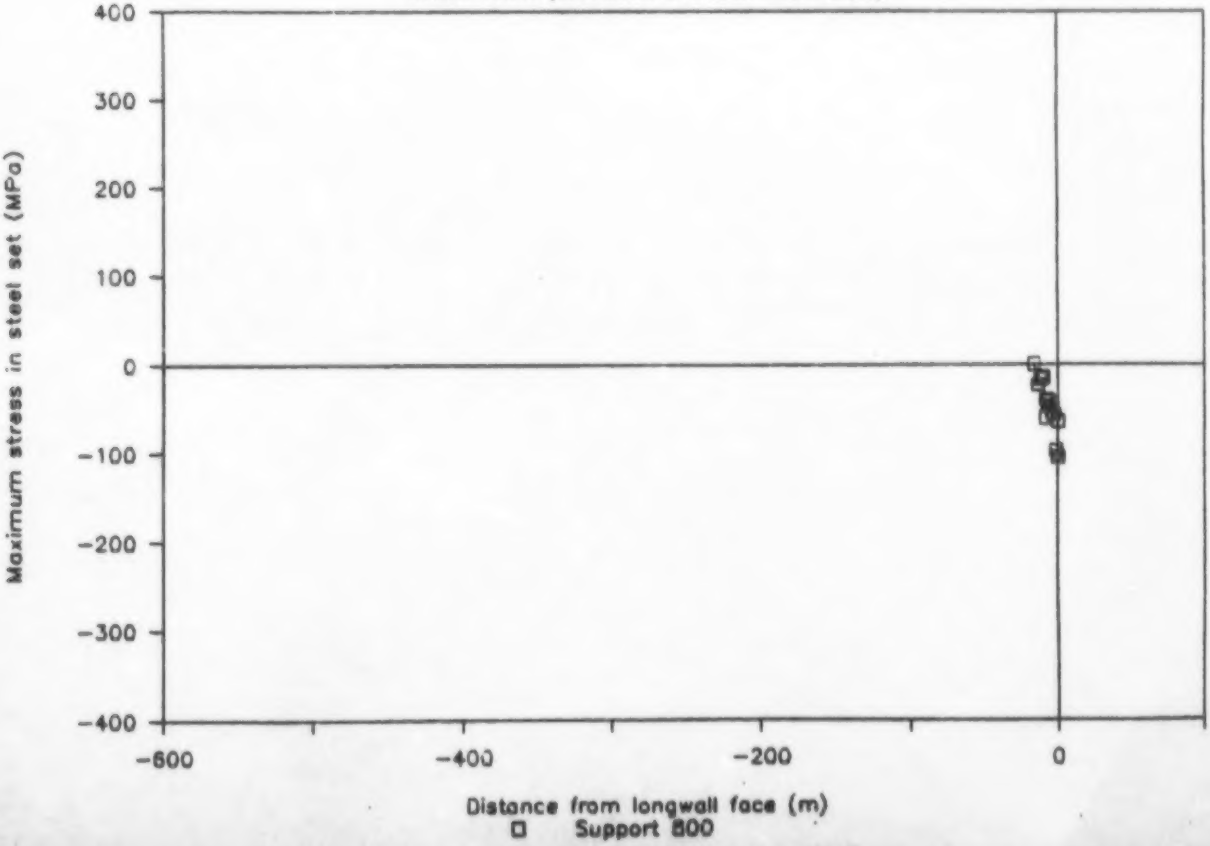
STEEL SETS (MAXIMUM STRESS, LOW SIDE)





TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)

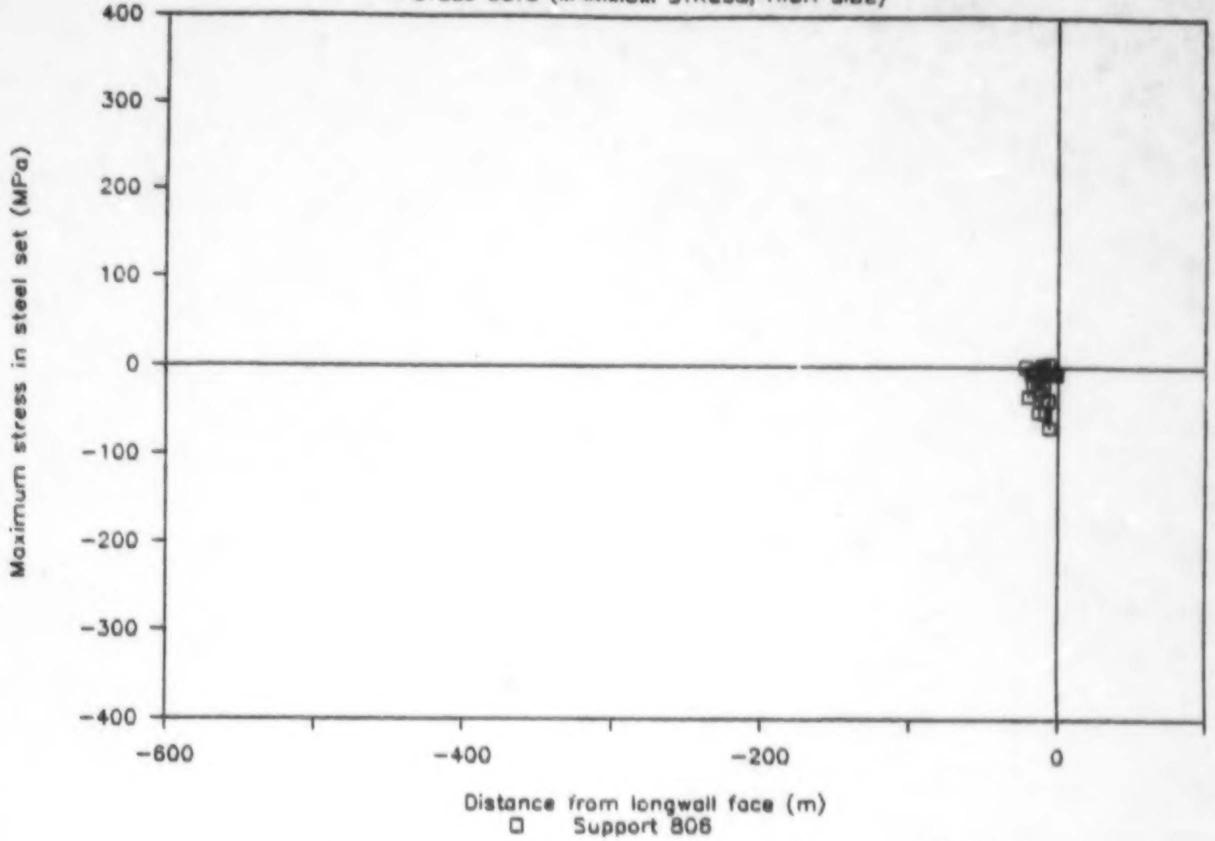


TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)

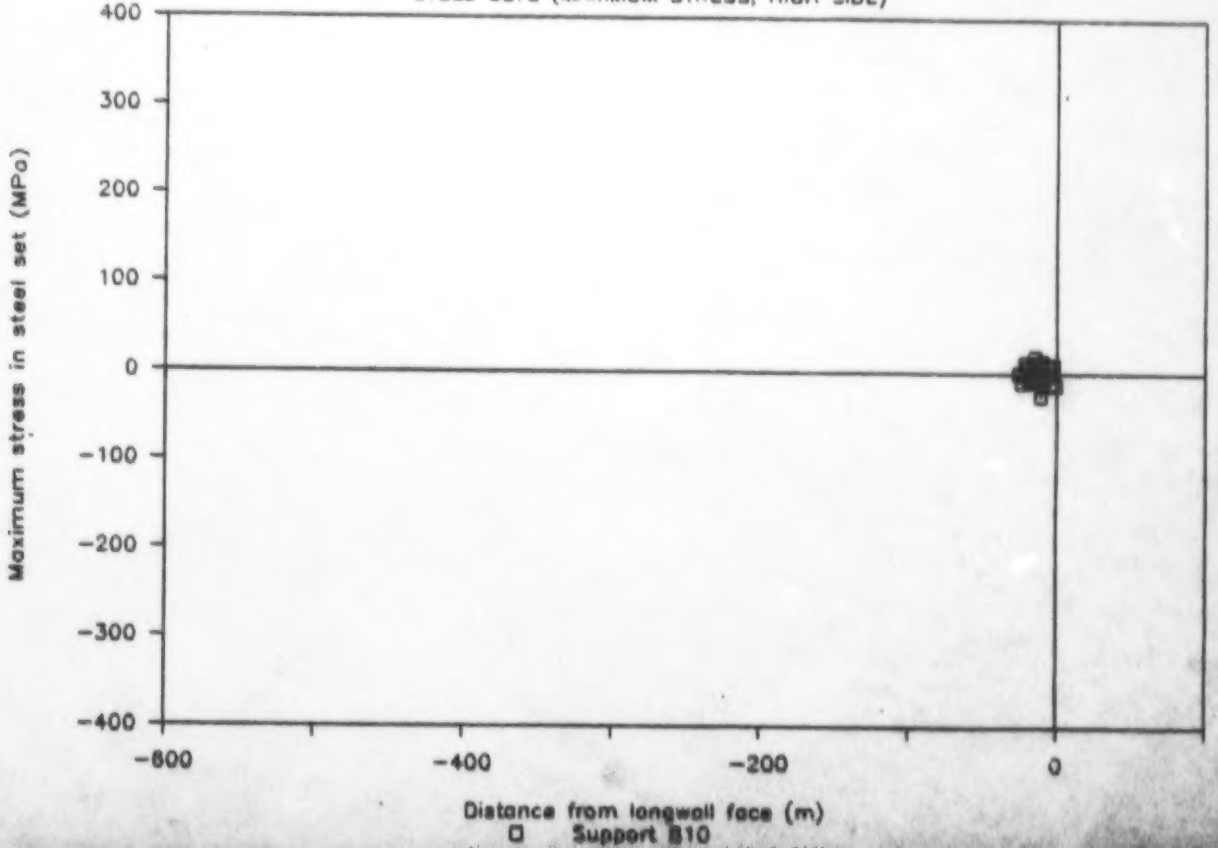
TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)



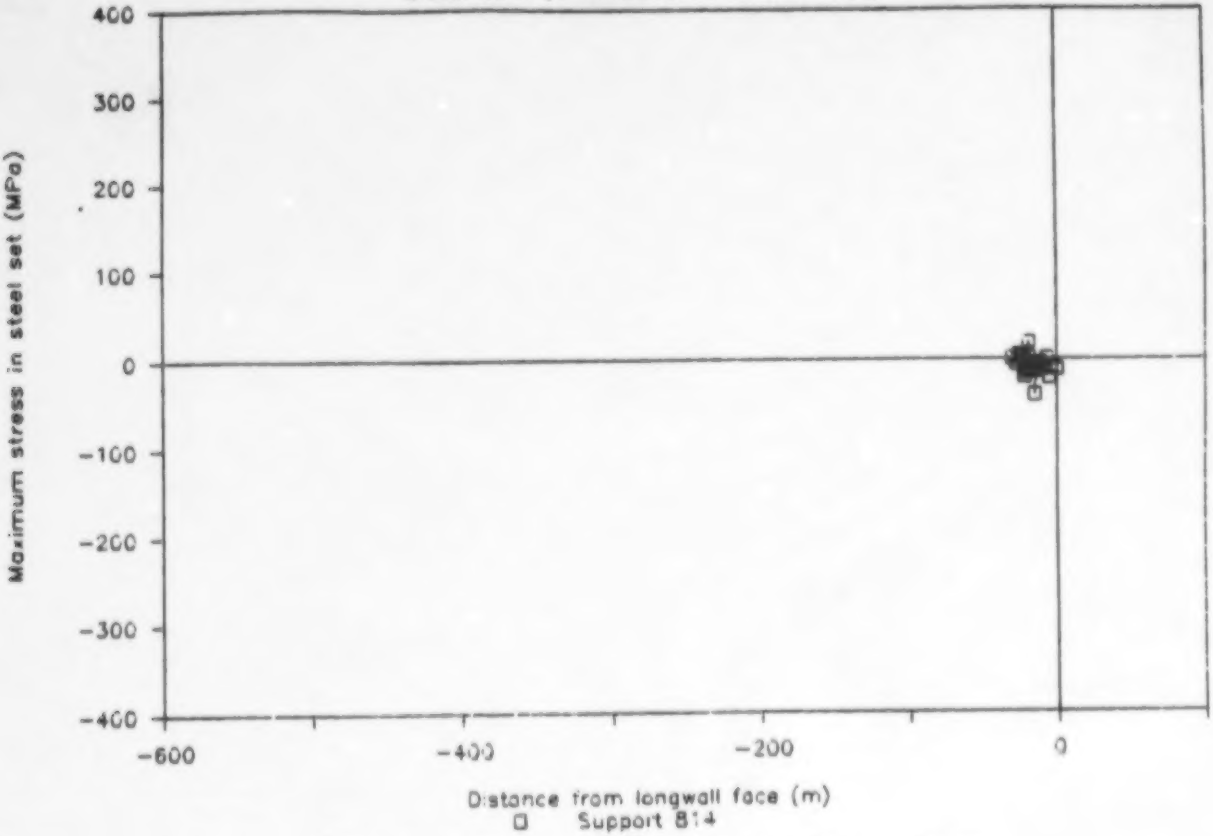
TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)



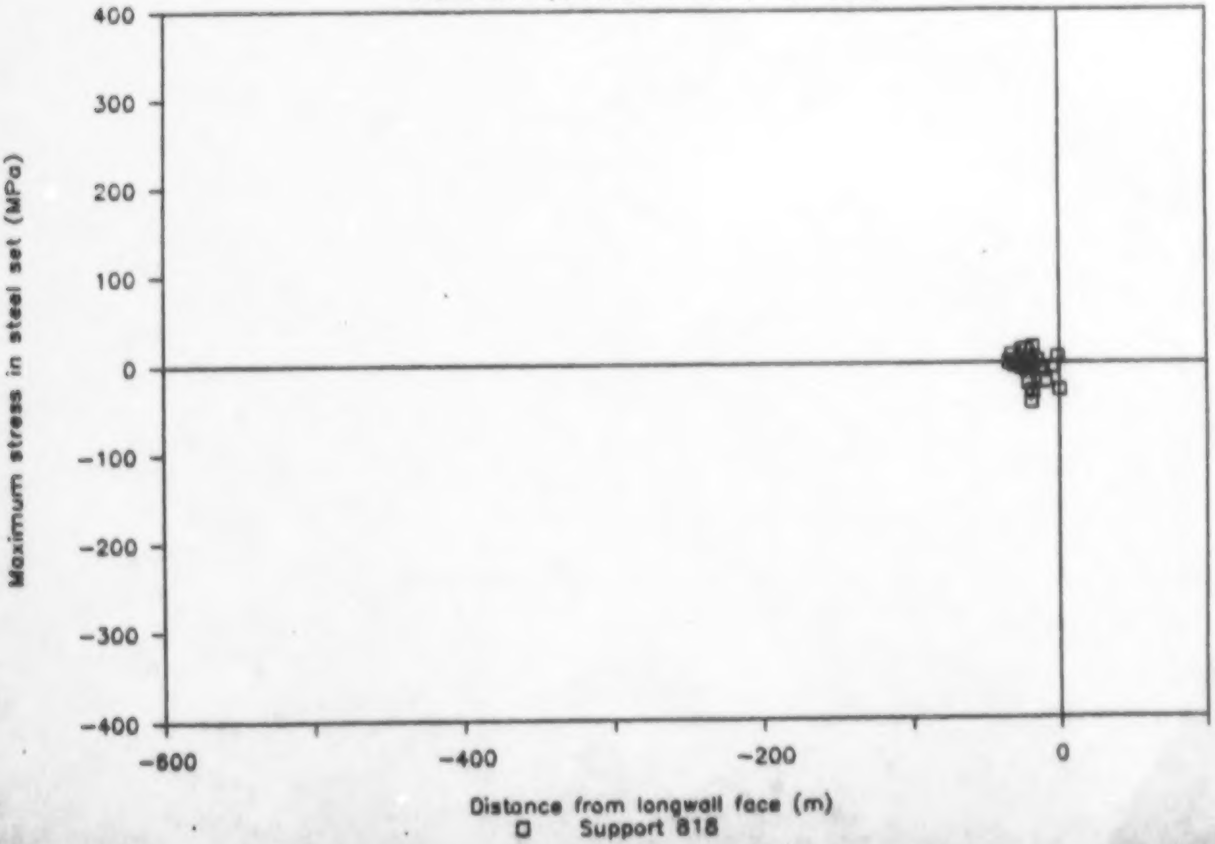
TEST SITE NO.2, PHALEN MINE

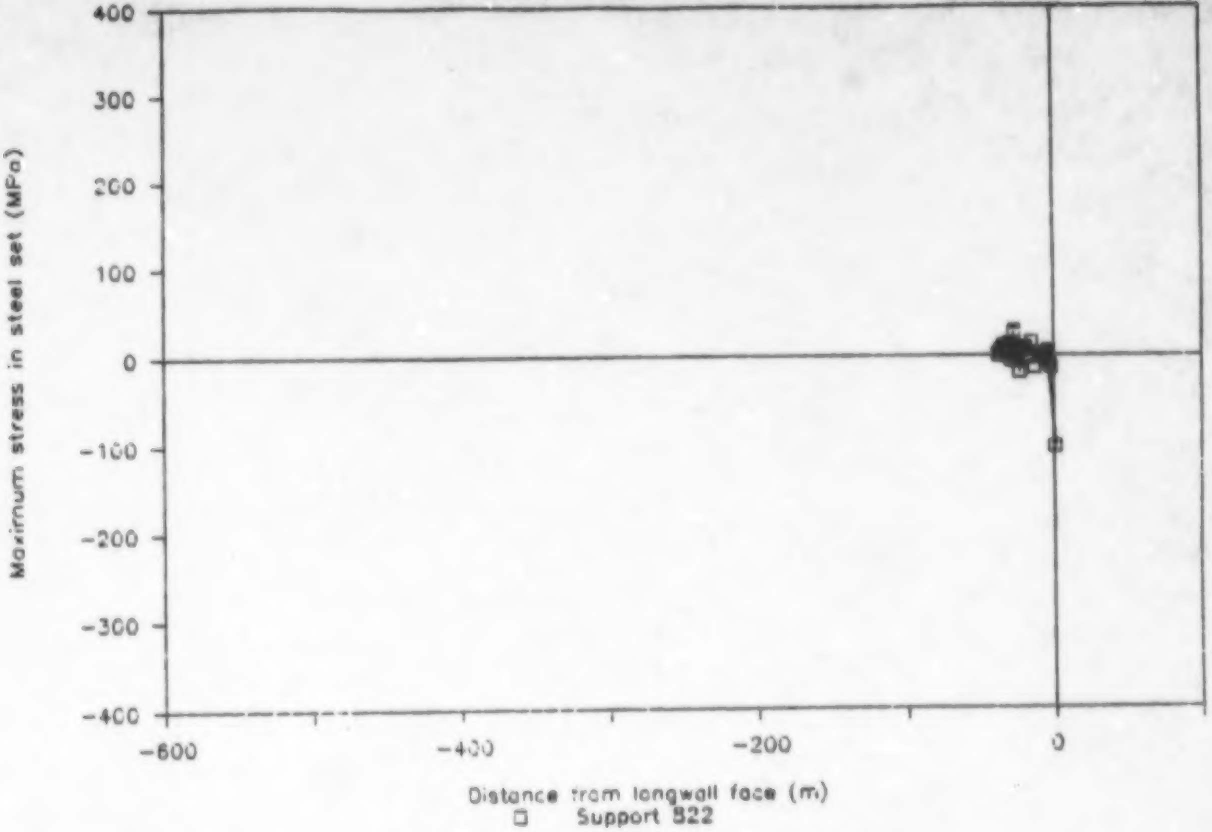
STEEL SETS (MAXIMUM STRESS, HIGH SIDE)



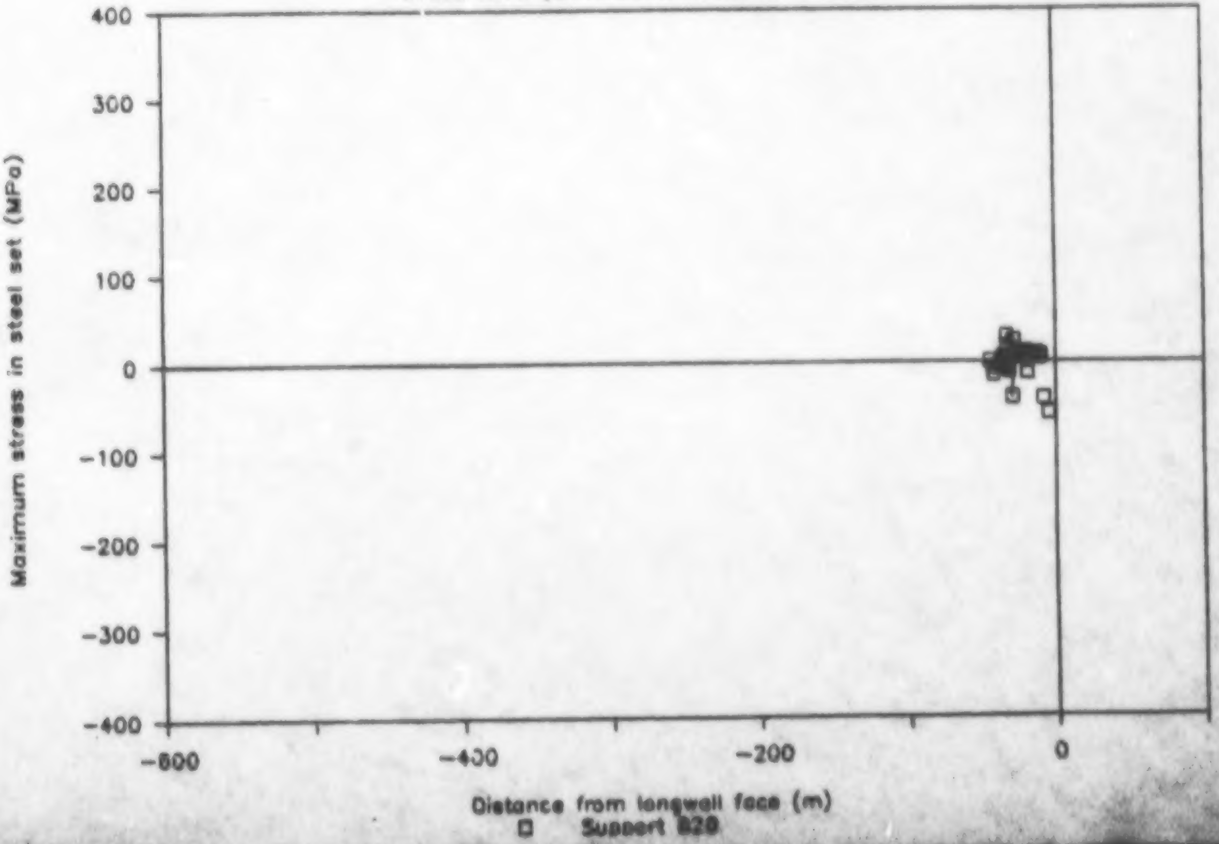
TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)

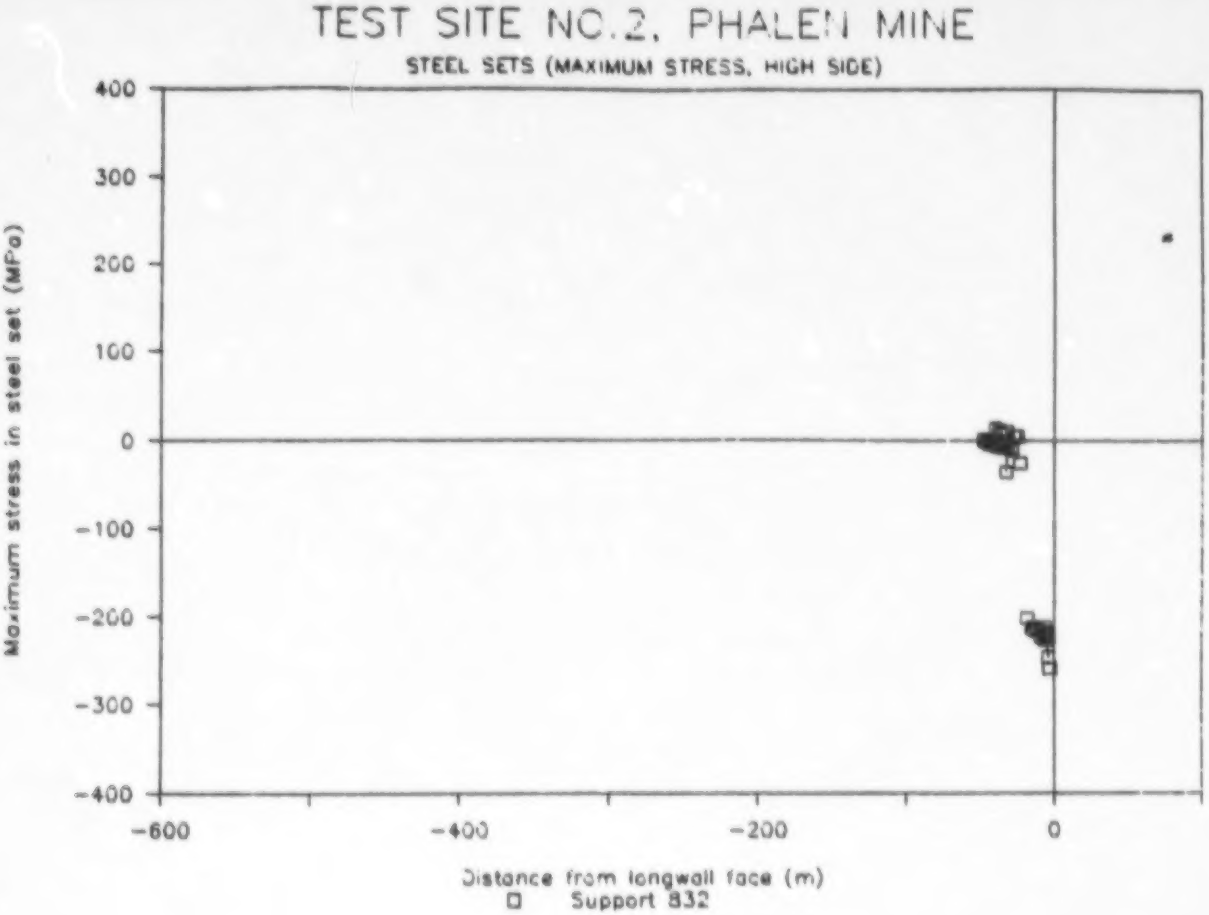


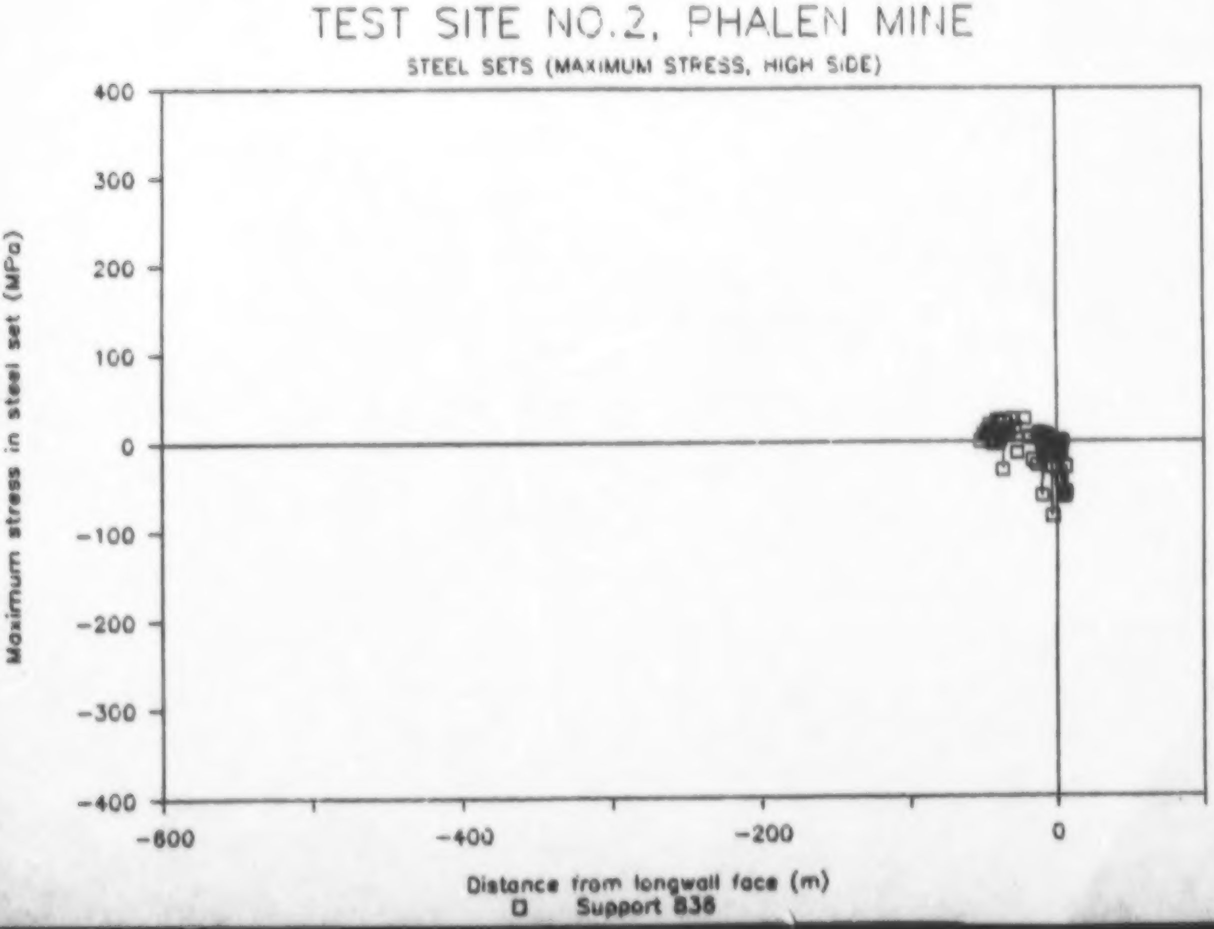

TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)


TEST SITE NO.2, PHALEN MINE

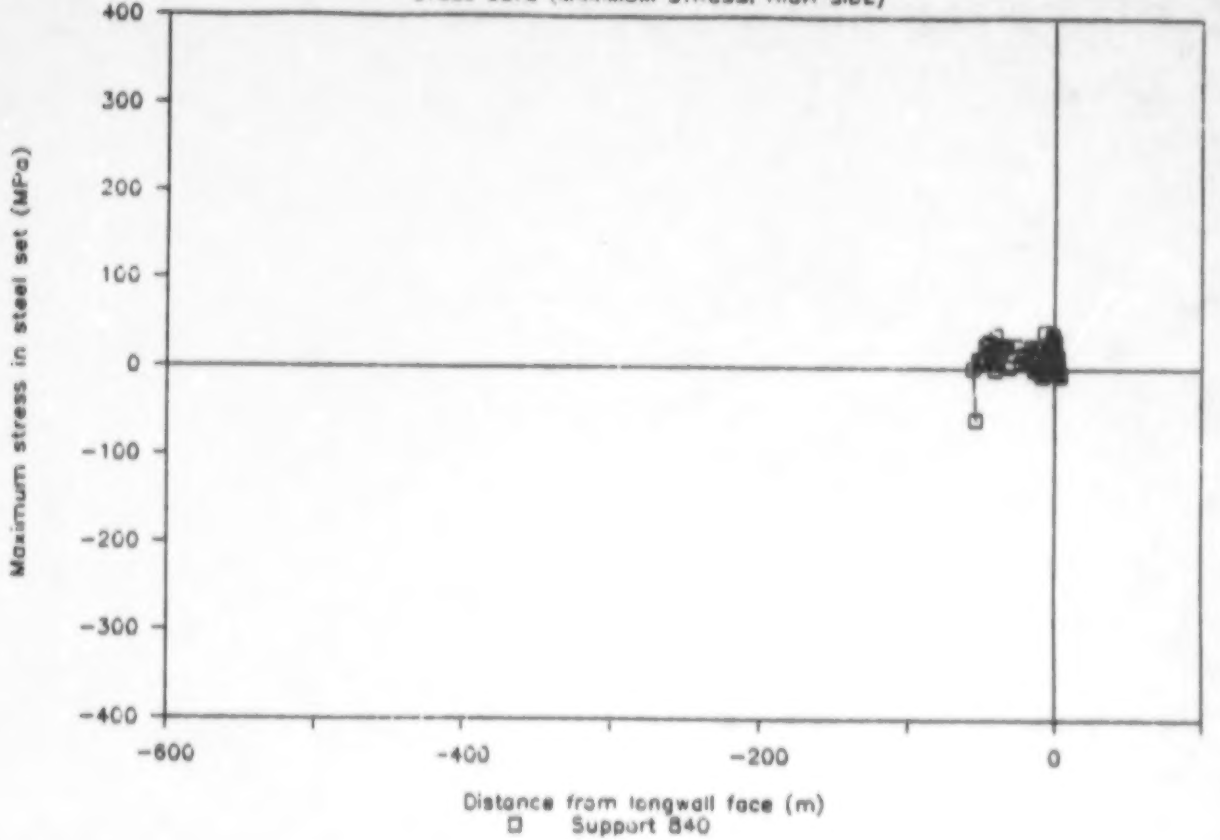
STEEL SETS (MAXIMUM STRESS, HIGH SIDE)


TEST SITE NO.2, PHALEN MINE
STEEL SETS (MAXIMUM STRESS, HIGH SIDE)
Maximum stress in steel set (MPa)
400
300
200
100
0
−100
−200
−300
−400
−600
−400
−200
0
Distance from longwall face (m)
□ Support 832


TEST SITE NO.2, PHALEN MINE
STEEL SETS (MAXIMUM STRESS, HIGH SIDE)
Maximum stress in steel set (MPa)
400
300
200
100
0
−100
−200
−300
−400
−600
−400
−200
0
Distance from longwall face (m)
□ Support 838

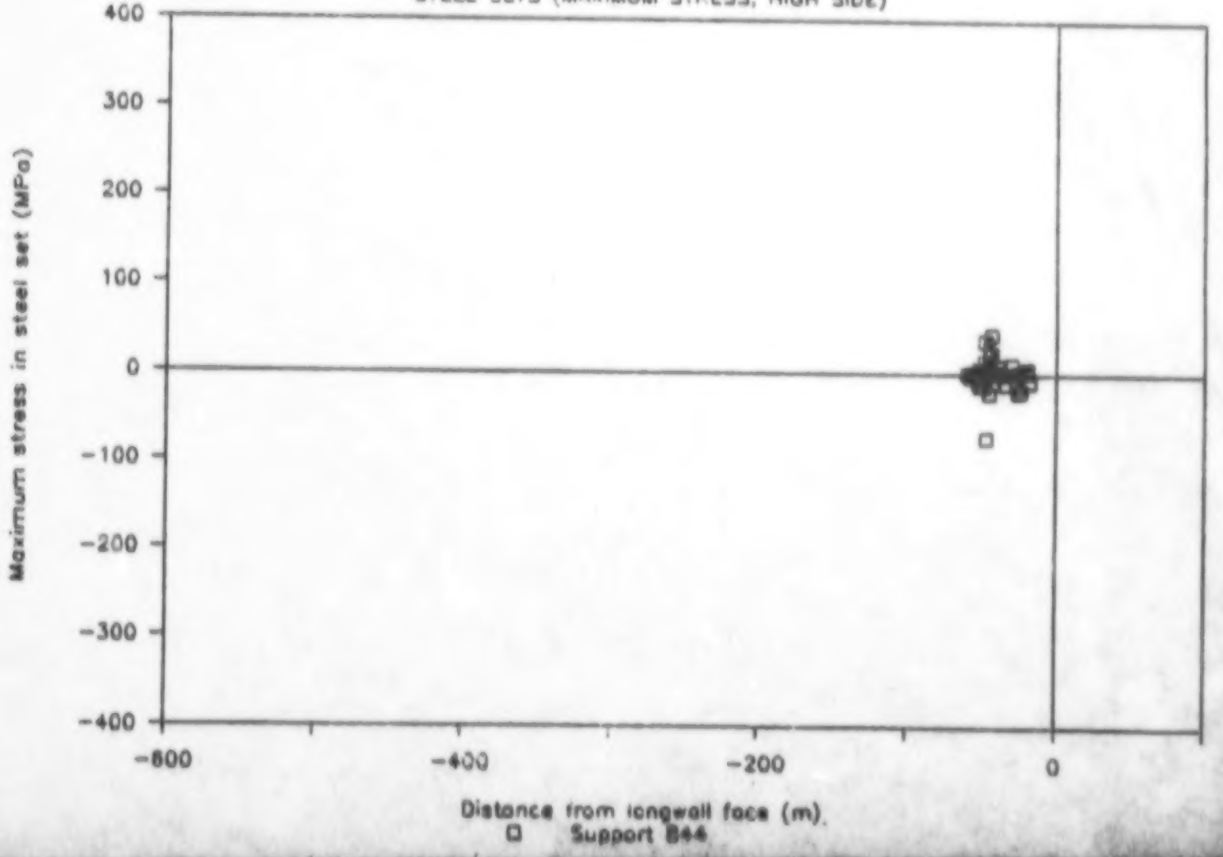
TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)



TEST SITE NO.2, PHALEN MINE

STEEL SETS (MAXIMUM STRESS, HIGH SIDE)


Maximum stress in steel set (MPa)
400
300
200
100
0
−100
−200
−300
−400
−800
−400
−200
0
Distance from longwall face (m)
□ Support 844